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MENTAL ABILITIES OF CHILDREN IN DIFFERENT SOCIAL AND CULTURAL GROUPS.
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INSTRUMENTS PREVIOUSLY DEVELOPED TO MEASURE MENTAL ABILITIES IN WESTERN CULTURES WERE MODIFIED AND USED WITH CHILDREN FROM A WIDER RANGE OF BACKGROUNDS. CHINESE, JEWISH, NEGRO, AND PUERTO RICAN CHILDREN FROM THE FIRST GRADE WERE SELECTED AND DIVIDED INTO 2 SOCIAL GROUPS AND 16 SUBGROUPS. THE TOTAL SAMPLE CONSISTED OF 320 CHILDREN WHO WERE TESTED FOR IDENTIFICATION OF VARYING INTELLIGENCE ABILITIES AND CULTURAL DIFFERENCES. EFFORT AND PERSISTENCE, PERSUASIBILITY, AND AGE WERE CONTROLLED IN THE ANALYSIS OF COVARIANCE DESIGN. THE RESULTS PRODUCED THESE GENERAL CONCLUSIONS - SOCIAL-CLASS AND ETHNIC-GROUP MEMBERSHIP HAVE STRONG EFFECTS ON MENTAL ABILITIES, AND PATTERNS ONCE EMERGED DO NOT ALTER WITHIN GROUPS. (RS)

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MENTAL ABILITIES OF CHILDREN IN DIFFERENT SOCIAL AND CULTURAL GROUPS

Cooperative Research Project No. 1635

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The purpose of this study is to examine the patterns among various mental abilities in first-grade children from different social class and cultural backgrounds. The patterns among four mental ability areas (space conceptualization, verbal ability, number facility, and reasoning) are studied within four cultural groups in New York City (Puerto Rican, Negro, Chinese, and Jewish), with each cultural group divided into middle class and lower class groups.

Until recent years there has been little empirical study of differential mental abilities in young children. In contrast, much theoretical and methodological progress (e.g., Balinsky, 1941; Burt, 1939, 1941, 1944, 1949, 1954; Carroll,1941; Clark, 1944; Garrett, 1946; Guilford, 1956, 1958, 1959; Kelley, 1928; Swineford, 1948, 1949; Thurstone, 1948; Vernon, 1950) has been made in defining the organization of differentiated mental operations in adults and in children old enough to respond to group tests. Within the past decade, however, sufficient knowledge has accumulated (e.g., Davis, Lesser, and French, 1960; Hurst, 1960; Meyers and Dingman, 1960; Meyers _et_ _al_., 1962) to indicate that differentiated mental abilities can be identified in children who are too young to read and write.

Our purpose is to extend the general demonstration that differential mental abilities exist in young children by examining the variations in the _patterns_ of these diverse abilities associated with variations in social class and cultural conditions. While it has been established that groups factors beyond a general ability factor exist in young children, little has yet been discovered

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about the differences in patterns of intellectual expression, the relative strengths related to different social class and cultural influences.

General Implications of this Research:

From both the theoretical and the practical points of view, the implications of this research issue are extensive. Certain of these implications are part of the growing discussions (e.g., Passow, 1963; Riessman, 1962) of the problems of the "disadvantaged" or "culturally deprived" children from "depressed" areas; however, in the absence of clear consensual definitions of these concepts and of substantial empirical evidence relevant to the opinions presented, it is difficult to formulate rigorous and testable propositions. The position taken here is that when the conceptual problems are viewed within the context of evolving theories of intelligence and an analysis of the sociological forces associated with social class and cultural influences, testable questions can be asked with greater scientific meaning and precision.

The attempt to establish similarities and differences between the structures of mental abilities in different social class and cultural groups is linked to several scientific issues. One such issue pertains to the long history of investigation of trait organization and intraindividual variations in test performance (cf., Anastasi, 1958a, Chs.10, 11). Social class and cultural group determinants of the structure of mental abilities also reflect upon the development of mathematical procedures for identifying the dimensions of human behavior (e.g., Guttman, 1954; Hotelling, 1933; Kelly, 1935;

Thurstone, 1947), and relate to a psychological issue with a most venerable background, the heredity environment controversy (e.g., Anastasi, 1958b; Carmichael, 1954; Gesell and Thompson, 1929; Loevinger, 1943). Evidence concerning the cultural antecedents and correlates of diverse mental abilities is also central to theory construction in developmental psychology; such evidence provides a clarification of both the basic nature and function of the mental abilities themselves and the characteristics of the cultural conditions which influence their development.

Implications for Psychological Assessment and Educational Procedures:

Perhaps the most compelling implications of this research on patterns of mental ability in young children relate to the practical efforts to determine the optimum educational conditions and the most valid assessment instruments for children from diverse backgrounds. The loss of outstanding intellectual talent represented within "culturally deprived" groups has been a source of increasing concern (e.g., McClelland, 1958; Wolfle, 1954, 1960). American society is dedicated to the encouragement of intellectual ability wherever it is found. However, before talent can be developed, it must be located and identified. In the last few decades, intellectual ability has been located primarily with the aid of a few popular tests of intelligence. The most popular test is the Revised Stanford-Binet which is usually used as a criterion of validity in the development of newer tests. For better or worse, we have in practice defined "intelligence" in terms of the most popular tests that presume to measure it.

The Binet-type test has been frequently criticized (e.g., Anastasi, 1958a; Freeman, 1962) as being too heavily loaded with verbal items that are both unfair to certain groups within our population and too narrow as assessments of intellectual functioning. We are failing conspicuously to discover outstanding talent in certain strata of our society. It is clear from the research literature (e.g., Anastasi, 1960; Strodtbeck, 1958; Wolfle, 1960) that lower socio-economic groups and certain cultural groups do not contribute their proportion of intellectually productive individuals.

Teachers must make both immediate and continuing educational decisions about children from different socio-economic and cultural backgrounds in order to provide effective classroom instruction. There is, however, a serious lack of valid information available regarding the abilities of these children for whom a teacher must make decisions. When a child is classified on the basis of a single global score such as a general intelligence quotient (even if the test is appropriate and valid for his cultural and socio-economic group), much remains to be known about the range and operation of his abilities. However, if that single global score is not only too narrow but is also inappropriate and invalid for his group because of its verbal loading, the information available to the teacher becomes even more obscure, and less useful. A score based on a test that is heavily loaded with one factor can tell little about the quality and quantity of the various talents that function within an individual.

The study of cultural differences in mental abilities attacks a fundamental, persistent problem for education and psychology: How do we provide valid psychological evaluation for children from widely dissimilar cultural groups? There is no doubt that one of the most pressing needs expressed by teachers and school administrators is for testing instruments which will provide fair, accurate, and broad assessment of the abilities of young children from cultural backgrounds other than those typical of our total school population.

School personnel in "underprivileged areas" contend that their children cannot possibly perform well on the available psychological tests because the tasks required of them by the tests are either unimportant or alien. The claim has often been made (e.g., Davis, 1948, 1951) that intelligence tests (such as the Stanford-Binet) were originally designed to measure those aspects of mental ability in which middle-class children were bound to excel and ignored those other aspects of mental ability in which the lower-class culture would encourage its children to perform favorably. This is understandable, since intelligence tests were developed to answer the need for prediction of performance in school. As long as schools function to train children who are best able to understand and work within standards that are based on middle class, white, urban values, such tests should do a reasonably good job of predicting those of superior academic "ability".

We are no longer satisfied with such limited educational goals, however. We must educate and help develop talents in those children who can contribute the most to our evolving civilization in ways that we may well not be able to anticipate today. This means we must broaden our definition of "ability" or "talent" to include behavior that is based on values which thus far have not been prominent in middle-class culture. We must be able to identify relative intellectual strengths within an individual, and we must be able to identify his individual intellectual strengths no matter what his cultural or socio-economic identity. Having once done this psychological assessment job, we must develop educational techniques that will help the most talented children develop their talents fully, though this may necessitate radical departure from traditional educational procedures.

Before the psychological assessment job can be begun, however, information is needed about the possible variations in the patterns of diverse mental abilities in relation to variations in social class and cultural conditions. In order to understand the relative strength of an individual child's mental abilities, we must have information as to how children of particular background (e.g., middle-class Puerto Rican or lower-class Chinese) tend to express their intellectuel abilities in contrast to how the majority of the school population tends to express its intellectual abilities. Perhaps one day intelligence tests can be developed that will yield a profile of scores among various mental abilities, with contrasting normative profiles for children of similar cultural and socio-economic identity and for children in the entire nation.

The Social Status Variables Studied:

This study examines the effect of three independent variables--social class, cultural background, and sex of the child (and the interactions among these variables) -- upon various mental abilities of young children.

Social Class:

Given the extensive literature which examines the social class and cultural influences upon such widely disparate phenomena as child-rearing attitudes (e.g., Davis and Havighurst, 1946), juvenile delinquency (e.g., Cloward and Ohlin, 1960; Cohen, 1955; Shaw and McKay, 1942), vocalization in infants (Irwin, 1948), sexual behavior (e.g., Kinsey et al., 1948), aggression (e.g., Lesser, 1959), moral judgment (e.g., Lerner, 1937), and achievement motivation (e.g., McClelland, 1961; Strodtbeck, 1958), the lack of attention to social class and cultural influences upon various forms of mental ability in young children is surprising. The few investigations of the topic are either not of recent origin or do not study young children (e.g., Havighurst and Breese, 1947; Havighurst and Janke, 1944; Janke and Havighurst, 1945) or they attempt to extract and eliminate "social class bias" from test content (e.g., Davis and Eells, 1953; Eells et al., 1951) rather than to study social class and cultural influences as inherently valuable substantive problems.

With some exceptions (e.g., Noll, 1960) these latter efforts to "control" (a term that Davis and Hess, 1951, prefer to "eliminate") cultural bias do not appear to have achieved notable success (e.g., Angelino and Shedd, 1955; Charters, 1963; Fowler, 1957; Freeman, 1962; Geist, 1954; Rosenblum, Keller, and Papania, 1955; Stablein, Willey, and Thomson, 1961; Warrington and Saupe, 1959). Anastasi (1960) reports that:

> "Recent studies, however, have raised doubts regarding the success of the Davis-Eells Games in eliminating social class differentials from test performance. There is evidence that even on this test high-status groups significantly excel low-status groups and that low-status children may do no better on this test than on such standard intelligence tests as the Binet and WISC." (p. 355)

Such factors as practice, motivation, testing-conditions, and form of items (Haggard, 1954) have been suggested as contributing causes to these persistent test differences.

What patterns of differences have been found between social-class groups and among sub-cultural samples when efforts are made to examine rather than reduce or eliminate such differences? While studies of social class variations in diverse mental abilities have been rare, an overall relationship between social class and general intelligence test scores /except for infants under 18 months of age (Furfey, 1928; Bayley and Genes, 1937)/ has been established for some time (e.g., Anastasi, 1958a, Ch. 15; Janke and Havighurst, 1945; Havighurst and Janke, 1946; Herrick, 1951). For example, on tests such as the Stanford-Binet and the WISC, the intelligence quotients of children whose fathers are in the professions average about 20 points higher than those of children of unskilled laborers (McNemar, 1942; Seashore, Wesman, and Doppelt, 1950). This broad relationship has usually been attributed either to a process of social selection (claiming that brighter people are more capable of climbing into the higher ranks of the social structure) or to the concept of mental stimulation (suggesting that the higher social strata are more likely to provide experiences necessary for intellectual development).

What social class differences do exist when the various mental ability dimensions (rather than "general" intelligence) are considered? There is virtually no information on this question for very young, preliterate children, but there is evidence (Havighurst and Breese, 1947) from the Primary Abilities Test scores of thirteen-year-old children that, while higher-status children show superior scores for all variables, social class differences are greatest for the Verbal, Word-Fluency, and Number variables and less striking for Space, Reasoning, and Memory. No subsequent confirmation of this general finding has accumulated, except for the numerous studies (e.g., Deutsch, 1962; Jones, 1962; McCarthy, 1954; Templin, 1957) which report the superiority of middle-class to lower-class children in mastery of several aspects of linguistic skill, including both receptive and expressive facets.

This verbal superiority of middle-class children was further demonstrated by Eells _et al_. (1951). They conducted item analyses of ten widely used group intelligence tests in an attempt to locate variations among the items in the amount of advantage given the higher-status children. The greatest differences between children from different social class groups occur for verbal items and the smallest differences for items employing pictures and geometric designs.

Several explanations have been offered for this verbal superiority. Bernstein (1960, 1961) points out that the lower class tends to use informal language and mainly to convey concrete needs and immediate consequences, while middle-class usage tends to be more formal, diversified, and flexible, emphasizing the relationships among concepts. It has been noted that the verbal limitations of lower-class children are only in part due to vocabulary deficiencies; they also arise from unfamiliarity with language patterns used in drawing verbal analogies, organizing a sequence of verbalized ideas, and communicating effectively. The social class differences in verbal connotations, idioms, and sentence patterns which characterize family dinner conversations have appeared to be so marked that they have been proposed as providing an efficient index of social-class placement.

Despite these indications that social-class differences have more impact on certain mental abilities than others, there also is evidence that the overall test superiority of higher-status children overshadows any variations in degree of superiority. Eells _et al_. (1951) state their general conclusion that status differences persisted on virtually all items, regardless of their form. Even when the items were categorized according to mental operations (analogies, opposites, etc.), no consistent or meaningful variations in the degree of status difference was discernible--the middle-class groups were superior to the lower-class groups on all mental ability dimensions (Charters, 1963, p. 16).

Beyond these data on social class differences in discrete mental ability variables, some evidence (e.g., Roberts and Robinson, 1952; Mitchell, 1956) compares the factorial organization of mental abilities for high and low social status groups. For eleven- and twelve-year-old S's, Mitchell (1956) found that essentially the same factors (Number, Verbal Meaning, Space, Word Fluency, Reasoning, and a General Test factor) emerged from the factorical solutions for both status groups, but this organization of mental abilities was found to be much less differentiated for the low-status group. This was reflected in a larger "g" factor and less clarity and sharpness in the "simple structure" solution for the low-status group. Mitchell suggests that the reduced differentation associated with the low-status group was at least partly the result of the greater saturation of the general factor with verbal components. He concludes that all mental tests, including the tests of primary or special abilities, are more verbally weighted for the low-status child because he has not attained the requisite level of verbal competence to execute easily the modest verbal tasks that are inevitably involved in even the most "nonverbal" tests.

Cultural Background:

The most prominent and traditional of the comparisons among cultural groups in mental ability is the voluminous literature on Negro-white differences in intelligence (Bruce, 1940; Carson and Rabin, 1960; Dreger and Miller, 1960; Garrett, 1945a, 1945b, 1947; Klineberg, 1935, 1944, 1963; McGurk, 1951, 1953; Porteus and Babcock, 1926; Shuey, 1958; Semler and Iscoe, 1963; Tanser, 1939; Tyler, 1956; Weyl, 1960). Selective description and interpretation of this research literature is playing an increasingly conspicuous role in legal decisions (e.g., Scarlett, 1963) regarding school desegregation. During this controversy, few researchers have denied that, on the average, Negro children obtain lower mental test scores than whites. The argument has centered upon whether these established differences should be interpreted as reflecting innate differences or environmental determinants. Information relevant to this argument is accumulating gradually: for example, studies (cf., Anastasi, 1958a; Klineberg, 1963; Lee, 1951) which trace changes in test performance as life conditions improve or deteriorate, which assess the size of the differences longitudinally as the children get older, and which carefully examine the individual variations within the overall averages, all add to our theoretical understanding of the bases of cultural differences.

But what differences exist between Negro and white children when you look beyond the measures of general intelligence and achievement to assess diverse mental abilities? While many dimensions of Negro-white differences have been investigated (cf., Dreger and Miller, 1960) relevant research on mental abilities is scarce. Tyler (1956, p. 297ff.) reports that the superiority of whites is most marked in the areas of spatial perception and abstract thought, in linguistic and verbal tests it is significantly less, and in rote memory differences disappear. Tyler concludes that this pattern is consistent with the hypothesis of a Negro perceptual defect. No subsequent research has appeared to substantiate this conclusions, and the pattern of mental ability differences between preliterate white and Negro children remains essentially unstudied.

Beyond the extensive literature on Negro-white differences, only sporadic reports describe other aspects of cultural group influences upon intellectual development. In a study of New York City Puerto Rican boys and girls attending day nursery (Anastasi and deJesus, 1953), a global mean IQ on the Goodenough Draw-a-Man Test did not differ significantly from previously established white and Negro mean scores for children in the same area (Anastasi and D'Angelo, 1952). Anastasi and deJesus permitted the Puerto Rican children to respond to measures of language development in Spanish or English and on many of these measures they significantly exceeded the white norms for their age. The authors suggested the greater extent of adult contact in the family environment of the Puerto Rican children as a possible explanatory factor for these language proficiencies. However, a study of older Puerto Rican children in the same area (Anastasi and Cordova, 1953) found them to be significantly below test norms.

Jewish-American children tend to do very well on verbal tests and less well on tests involving concrete objects and spatial relations (Brown, 1944). This was also true for a college-age Jewish group (Held, 1941).

Studies done with various groups in Hawaii (Porteus, 1939) showed Japanese able to perform better on all mechanical aptitude tests and performance tests than Chinese, but the Chinese were able to score higher than the Japanese on test items of the Binet type or those dependent upon auditory memory span. On tests involving visual perception, spatial orientation, or sustained attention, Japanese-American children born in the United States were able to exceed significantly the norms of American white children (Darsie, 1926) but they fell below these norms on arithmetic and verbal tests.

Next to Negroes, probably the most frequently studied group has been the American Indian. Although degree of exposure to white American culture seems to have its own influence upon intelligence test scores of American Indian children (Klineberg, 1928), they generally do as well as white children on performance tests but less well on tests involving language (Anastasi, 1958). On a drawing test such as the Goodenough, however, Indian children may do significantly better than white children (Dennis, 1942; Havighurst, Gunther, and Pratt, 1946; Russell, 1943).

Italian-American children do less well with abstract items or those involving language skills and better on performance tests (Held, 1941). Mexican-American children do as well on performance tests as their white peers whose parents were born north of the border but less well on verbal tests of intelligence (Garth, Elson, and Morton, 1931), a finding similar to those with American Indian children.

Another prominent topic linking cultural conditions to intellectual growth is the study of bilingualism. Despite the imposing methodological problems in conducting such research (cf., Anastasi, 1958a, pp. 558-561; Jones, 1960), considerable evidence is now available. Within this body of evidence, controversy exists about the relationship between bilingualism and intellectual functioning. Most of the studies (e.g., Anastasi and Cordova, 1953; Jones and Stewart, 1951; Levinson, 1959; Smith, 1949, 1957; Weinreich, 1953) concluded that bilingualism has a detrimental effect on intelligence test performance, a smaller proportion of the investigations (e.g., Hill, 1936; Pintner and Arsenian, 1937) found little or no significant influence of bilingualism on intelligence, and several recent studies (e.g., O'Doherty, 1958; Peal and Lambert, 1962) present theoretical arguments and empirical evidence suggesting that bilinguals perform significantly better than monolinguals on both verbal and non-verbal intelligence tests. Of special interest for the present study is Peal and Lambert's (1962) finding that the structures of intellect differ for bilinguals and monolinguals; the bilinguals appear to have a more diversified set of mental abilities than the monolinguals.

Despite all of the foregoing material describing social class and cultural differences in intelligence, a primary caution must be observed: It is not known whether the observed differences are a function of real variations among social class and cultural groups or reside in characteristics built into the tests used to study the differences. The degree to which social status contrasts may be assigned to respondent variability (when responding to truly common stimuli) or to variations in the meanings of the stimuli is still unresolved.

Sex Differences:

Sex differences in ability patterning have been observed as early as first grade (e.g., Avakian, 1951; Tyler, 1951) as well as among elementary school children and college students (cf., Anastasi, 1948). In a number of these studies, spatial and quantitative factors emerged more clearly as separate abilities among boys than among girls. All studies in which sex differences in trait organization have been investigated agree in showing differing factorial composition for at least some tests in the case of the two sexes (cf., Anastasi, 1958a, Ch.14).

Differences in favor of boys have been repeatedly reported in tests of spatial and mechanical ability (e.g., Havighurst and Breese, 1947; Herzberg and Lapkin, 1954; Hobson, 1947; Wesman, 1949; Witkin, 1954).

With almost equal consistency, tests of many verbal or linguistic functions indicate female superiority (e.g., McCarthy, 1954; Terman and Tyler, 1954). However, there are indications (e.g., Havighurst and Breese, 1947; Herzberg and Lapkin, 1954; Hobson, 1947) that this sex difference in favor of girls is more uniform in tests of Word Fluency (W) than Verbal Comprehension (V). It appears evident that girls do relatively better in word fluency and in tasks involving mastery of the mechanics of language then they do in vocabulary, verbal comprehension, and verbal reasoning tests.

On numerical tests, differences do not appear to emerge until children are well-advanced in their elementary school years. Then, tests measuring speed and accuracy of computation show either no sex differences or, more often, a difference in favor of girls (e.g., Havighurst and Breese, 1947; Terman and Tyler, 1954). On the other hand, on arithmetic problems and numerical reasoning tests, boys usually score higher (e.g., McNemar, 1942; Terman and Tyler, 1954; Wesman, 1949).

A few studies report sex differences in reasoning. Havighurst and Breese (1947) report that girls score higher on the Reasoning (R) subtest of the PMA. However, as already indicated, boys appear to excel in reasoning in a numerical context, and sex differences in reasoning in verbal contexts tend to be negligible or inconsistent. To complete the cycle of contradictory findings for reasoning tests, Sweeny (1953) found males significantly superior on problems calling for "restructuring", and Kostik (1954) found that boys were better able to transfer, to apply skill and knowledge to new situations.

In sum, the literature indicates male superiority for spatial tests and for numerical reasoning, female superiority for word fluency and numerical computation, and conflicting evidence for reasoning skills.

Interrelationships among Social Class, Cultural Background and Sex:

As important as each of these independent variables of social class, cultural group, and sex may be when considered singly, it is likely that the most productive information will emerge only when they are all considered simultaneously, allowing the interactions among them to appear.

The research literature provides little precedent for predictions about the nature of the interactions among social class, cultural group, and sex associated with the development of various mental abilities in young children. Some studies provide tentative suggestions. For example, in a survey of third grade Negro children, Robinson and Meenes (1947) found a 13- to 14-point difference in mean IQ between high and low social class groups; among samples of white children, this difference is generally about 20 points (cf., Anastasi, 1958a, Ch. 15). While this finding suggests the interaction effect in which social class influences upon intelligence are greater in white than in Negro groups, it may also be assigned to a narrower social class range among Negroes.

Another suggestion of an interaction effect (between cultural group and sex) emerges from Anastasi and D'Angelo's (1952) study in which Negro five-year-old preschool children were generally slightly lower than whites on language ratings of sentence length and structure, but sex differences were in an opposite direction for the two racial groups; Negro boys scored higher on the language ratings than Negro girls, white girls higher than white boys.

Since few studies have as yet considered several independent variables simultaneously in their impact upon several mental ability variables, interaction effects are difficult to anticipate. Since several social status variables do indeed interact to produce the child's real social environment, their interrelationships should clarify issues related to the development of diverse mental abilities.

Hypotheses:

Anastasi (1958a) concludes that one reason for the slow progress of studies of sub-cultural variations in intellectual development is the fact that our concept of intelligence is itself culturally conditioned and restricted:

> "It is not so much that tests are unfair to lower-status groups, as that lower-class environment is not conducive to the effective development of "intelligence" as defined in our culture." (p. 534)

Our culture, however, has gradually begun to supply several definitions of intelligence. The most popular definition to date has been, of course, the concept of general intelligence, and for this concept, Anastasi's conclusion appears inescapable. For many reasons, however, the differential approach to the definition and measurement of ability is becoming one of the chief distinguishing characteristics of contemporary psychology and education (cf., Anastasi, 1961, Ch.13). Adopting the differential definition that intelligent behavior can be manifested in a wide variety of forms, we can then examine in detail the relative degrees to which different social environments are conducive to the effective development of various mental skills. This position provides the premise for the hypotheses tested in the current study: cultural influences differ not only in degree but in kind, with the consequence that different kinds of intellectual skills are fostered in various environments.

The hypotheses to be tested are:

(1) significant differences exist among groups of children from different social class and cultural backgrounds in each of four mental ability areas, i.e., space conceptualization, verbal ability, number facility, and reasoning ability.

(2) significant differences exist among groups of children from different social class and cultural backgrounds in the pattern or configuration of scores from these diverse areas of mental ability.

(3) significant interactions exist between the variables of social class and cultural group in determining the level of each mental ability and the nature of the patterns among them.

To test these hypotheses, the Hunter Aptitude Scales (Davis, Lesser, and French, 1960) were revised and adapted. These scales were constructed originally to provide a broad assessment of diverse mental abilities in young children; they measure reliably space conceptualization, verbal ability, number facility, and reasoning ability in a middle class sample of 4- to 5-year old children. Through the earlier application of these tests, certain psychometric properties of the scales (e.g., reliability coefficients, intercorrelations among the five tests, amount of unique, non-chance variance contributed by each test, etc.) were established (Davis, Lesser, and French, 1960). The present research extends the application of these instruments to the study of young children from different social class and cultural backgrounds. The original scales and the present adaptions will be described in detail later.

In the present study, first grade children were studied from both middle class and lower class families among the following cultural groups in New York City: Puerto Rican, Negro, Chinese, and Jewish. Details of sample selection will also be described later.

This study of social class and cultural variations in diverse mental abilities departs in general strategy from earlier test-making approaches (e.g., Davis and Eells, 1953; Eells _et al_., 1951) that were designed to reduce cultural bias from test results; the procedure of selecting test items principally on the grounds that they do _not_ discriminate between cultural groups is an extremely restrictive, if not reversed, approach to the study of intellectual functioning

(Charters, 1963, p. 19). In contrast, the current research shares the position stated by Lorge 1953):

> "There is no virtue in developing instruments so blunted that they decrease the amount of information. Perhaps the best method for reducing bias in tests of intelligence is to use them with the full knowledge that endowment interacting with opportunity produces a wide range of differences. Appraisal of the variation of different kinds of intellectual functioning requires many kinds of tests so that the differences can be utilized for the benefit of the individual and for the good of society. Intellectual functioning certainly does involve the ability to learn to adjust to the environment or to adapt the environment to individual needs and capabilities by the process of solving problems either directly or incidentally. Such a concept recognizes a variety of different kinds of problems. The full appreciation of the variety of aptitudes and the development of adequate methods for appraising them, should in the long run, ultimately lead to the production of enough information to eliminate bias."

Our current effort is to produce some portion of such information.

Method

A. Methodological Problems:

A test of the proposed hypotheses encounters formidable methodological obstacles, sharing all of the technical problems inherent in studies of two difficult research topics: comparisons among different cultural groups, and the development of intellectual functioning in young children. An overview of the major methodological problems is presented below and our general solutions are offered; the detailed implementation of these proposed solutions are described in subsequent portions of this Methods section.

1. Perhaps the primary technical problem is to insure the fact that observed differences among social class and cultural groups reside in the respondents and not in the test materials themselves (or in the definitions upon which the tests are based). To accomplish this, tests were constructed which presuppose only experiences that are common and familiar within all of the different social class and cultural groups. There was no intention to "free" the test materials from cultural influence, but, rather, the tests utilize elements which appear commonly in all cultural groups in New York City.

2. An attempt to study the organization of mental abilities in different groups must elicit group factors reliably and unambiguously. It is thus desirable to have more than one test representing each factor to be identified, the tests must have adequate lower and upper limits in order to prevent artificial restriction of range among such young children, and they must be of sufficient length and precision to yield reliable measures with young children.

3. A major difficulty lies in achieving an unambiguous definition and assessment of criteria for social class and cultural group placement. Both variables are obviously multidimensional in nature, and to define and measure the necessary components is a formidable task. Since members of each cultural group were to be located in both lower and middle class categories, additional problems arise in attempting to maintain an equal degree of separation between the social class categories for each cultural group.

4. In any effort to study the effect of combinations of independent variables such as social class, cultural group affiliation, and sex, numerous sources of variation must be physically or statistically controlled. Groups must be equated or group differences measured for a host of test influences, including such variables as extent and quality of formal schooling, language handicaps, interest, effort, attention span, ability to understand and follow verbal directions, ability to read and write, familiarity with the test-taking situations, general desire to excel, test-taking motivation, rapport with the examiner, and speed of response. Failure to control or assess these and several similar test influences would make observed social class and cultural group differences in mental ability patterns virtually uninterpretable. We shall attempt to indicate the status of each of many test influences appearing in the comprehensive listing which follows (adapted from Goslin, 1963, pp. 131-152; McClelland, 1958, pp. 1-28) under one of five headings: (1) under substantive study in this research, (2) controlled physically by maintaining constant conditions for all S's,

(3) controlled statistically by measurement and analysis, (4) uncontrolled, (5) confounded.

B. Status of Various Test Influences in this Research:

I. Variables of Background and Environment:

(A) Cultural background and informal experiences:

These test influences are under substantive study in the present research.

(B) Family characteristics:

It is not the intention of the present study to investigate all or even many of the variables operating in the family setting which may contribute to the development of distinctive patterns of mental abilities; the present plan is to discover the patterns which may exist and then to attempt to assign these patterns to the family influences or other environmental or constitutional forces that determine them. Consequently, only two aspects of information about the family were obtained (beyond the data on occupation, education, and dwelling area, which provided the index of social class position): intactness of family, and number of siblings. These variables may be regarded as both under substantive study and (when extracted from the relationships between cultural groups and patterns of mental ability) under statistical control.

(C) Formal school training:

It is clear (e.g., Husen, 1951; Lorge, 1945; Owens, 1953) that the extent and nature of formal schooling that the child receives affects his test performance, and, more specifically, the patterning of mental abilities (Garrett, 1946; Fillela, 1957; Lee, 1951; Vernon, 1950; Vernon and Parry, 1949). Schooling differences are especially conspicuous when different social classes or majority-minority groups are compared. Where there is no intention to study such differences in the quality of schooling directly, some form of methodological control is demanded.

Our original plan was to exercise physical control over this test influence by testing kindergarten children who had no previous formal educational experience. Since kindergarten attendance is voluntary, however, this decision introduced a selection bias related to the differences between parents who choose to send their children to kindergarten and those who do not. Consequently, first grade children were studied and a record kept of those in each group who had previously attended kindergarten. Our intention here, then, is to exercise statistical control over the test influence of previous formal schooling.

Differences between private school and public school attendance were also considered. While the use of some private school samples would have facilitated locating certain groups (e.g., middle class Puerto Rican, middle class Negro, middle class Chinese, lower class Jewish) physical control was exercised by excluding all private school sources and restricting selection to public schools.

(D) Experience with similar tests:

The importance of test-taking experience is reflected essentially in (1) comprehension of test directions and the nature of the tasks, (2) facility for manipulating test materials, and (3) the ability to withstand the pressures of the testing situation.

Several steps were taken to provide physical control by equating these test influences for all groups: (1) all tests were administered individually; reading and writing were not required of the examinee, (2) directions were stated in the simplest possible terms, (3) psychological testers who spoke one of the primary language of the cultural groups (Spanish, Yiddish, several Chinese dialects) administered the tests so that the instructions and test questions could be given in English, the primary language of the child's cultural group, or (more often) in the most effective combination of the two languages for the particular child, (4) extensive practice materials were provided in introducing each subtest to insure comprehension of the directions and to allow each child to become familiar with the test materials and the requirements of the task; it was only after the tester was convinced that the child understood what was being asked of him that the scored test items were presented, (5) the pressures of testing were controlled by allowing long periods of acclimation to the testing situation and to the examiner, (6) testers were recruited from the same cultural group as the child being tested; considerable evidence (e.g., Anastasi, 1958a, pp. 561-570; Canady, 1936) indicates the importance of matching the general cultural backgrounds of tester and testee, (7) since each child was tested in his own public school building, a degree of familiarity with the physical surroundings was insured.

While it is clear that these provisions for physical control cannot eliminate any long-standing differences in test-taking experience accumulating during the entire period of the child's development, the factors enumerated above appeared to be the most immediate and compelling features.

(E) General health and special handicaps:

Physical control was exercised over these test factors by excluding from consideration all S's who displayed health problems (e.g., impaired sight, hearing, or coordination, emotional disturbance, etc.). Impressions concerning the presence or absence of these conditions were confirmed with school personnel.

(F) Age:

Age changes in test performance are well established (cf., Anastasi, 1958a, Ch. 8); among the most venerable topics in education and psychology are the regularities and irregularities of of intellectual development and the predictive value of intelligence test scores (topics which are usually subsumed by the term "IQ Constancy"). To exercise physical control over the age variable, a limited age range was used -- children 6 years 2 months through 7 years 5 months were tested. Since there remained some possibility that, even within this restricted range, age differences affect test performance, statistical control was exerted by recording birthdates and studying age differences in test scores on the several mental ability dimensions.

II. Personality and motivational variables:

We were concerned with several determinents of the degree to which a child applies his capabilities in the test situation.

(A) Persuasibility or responsiveness to examiner:

The child's responsiveness to the tester is an important determinant of test performance. This variable was statistically controlled by measuring the "examiner persuasibility" (EP) of each child. The EP measure will be described in the section on methods of data collection.

(B) Interest in test problems:

Interest in the test materials and tasks was physically controlled by consultations during test construction with school personnel among each cultural group to confirm the potential level of interest in proposed test forms and materials, and by extensive pre-testing with children from each social class and cultural category. An element of statistical control over the interest variable was introduced by obtaining a broad estimate of the child's desire to repeat the overall testing experience; this measure is also described in the section on methods of data collection.

(C) Effort and persistence:

Interest in the test is important operationally insofar as it determines the S's effort, persistence, attentiveness, and willingness to concentrate on solving problems and supplying answers. Through individual test administration conducted by a skilled examiner of a cultural background similar to the S's, elements of physical control were exerted. In addition, a measure of effort and persistence was used to provide statistical control and will be described later.

(D) Anxiety level:

While it has been demonstrated that a minimum or moderate level of anxiety may facilitate test performance, anxiety often operates to inhibit test functioning (e.g., Grooms and Endler, 1960; Sarason, Lighthall, Davidson, and Waite, 1960). Individual administration, gradual acclimation, and test administration by a skilled examiner from a cultural background similar to the S's were all introduced to allay the young child's anxiety. In addition, children displaying extreme tension in the classroom or during the early phases of testing were not included in our samples. But since individual differences in degree of tension were, of course, still observable, the anxiety variable must be regarded as essentially uncontrolled. Time limitations did not permit statistical control through the use of appropriate measures such as the Test Anxiety Scale for Children (Sarason et al, 1960).

(E) Achievement motivation:

Considerable evidence (e.g., French, 1958; Lesser, Krawitz, and Packard, 1963; McClelland, Atkinson, Clark and Lowell, 1953; Rosen, 1955; Winterbottom, 1958) indicates the crucial role of achievement motivation (defined as the striving for success in situations where performance is evaluated against some standard of excellence) in determining the responses of children in learning and testing situations. Achievement motivation also has been related to perceived chances of success and failure in testing situations (e.g., Atkinson, 1957; Atkinson, Bastian, Earl and Litwin, 1960; Atkinson and Litwin, 1960), which is, in turn, related to test performance. It would be valuable to study substantively or control statistically this variable, but time limitations and the absence of valid measures of children at the first grade age dictated the uncontrolled status of the achievement motivation variable in this research.

III. Characteristics of the testing situation:

(A) Perceived importance of the test:

This variable resembles the "incentive value" concept (Atkinson, 1957) reflecting the degree of satisfaction or dissatisfaction which the S attaches to achievement or non-achievement of succesful test behavior. Insofar as this variable is related to effort, persistence and responsiveness to the examiner, it may be regarded as statistically controlled.

(B) Expectations of success or failure:

Anticipations of success or failure produce important motivational effects. One primary basis for the child's estimating the likelihood of his success in the test situation is his previous history of success and failure in similar evaluation situations. Mention has already been made of the degree of test-taking experience as providing practice, but it is also true that the quality of performance in previous test-taking will affect the S's confidence in performing successfully and, consequently, his test productivity. Some element of physical control is exerted by the skilled examiner's ability, in an individual test session, to regulate the child's discouragement in response to perceived failure. But while the S's expectations would, again, have been of substantive interest or an important statistical control, time limitations and the absence of valid measures for young children made this unfeasible. This variable is regarded as essentially uncontrolled.

(C) Temporary physical conditions.

Fatigue, transient respiratory or digestive ailments, or other temporary indispositions obviously have some impact on test performance. When examiners received information about such conditions from the teacher or observed their signs directly, testing was postponed. Not all transient physical difficulties are readily discernible, but this variable is considered physically controlled.

To control further the effects of fatigue, a testing schedule was established to administer the entire test battery in three or more separate sessions, each of 30-45 minute duration. (All sessions were completed within a maximum interval of four weeks to restrict age changes in subtest performance.) If the child appeared fatigued or if signs of any other physical distress appeared, the session was curtailed.

(D) Interference from the testing environment.

All test sessions were conducted in the child's school. No rigorously standardized practice regarding the site of testing could be maintained, and in some instances, noise, interruption, insufficient space, and other mechanical limitations were unavoidable. Most often, however, a quiet or secluded room was made available. If minimal conditions for acceptable testing could not be maintained, the testers were instructed to postpone testing. This variable is considered physically controlled.

(E) Influence of the tester:

Much information (e.g., Phares and Rotter, 1956; Sarason, 1962; Sarason and Minard, 1963; Smith and Rockett, 1958) indicates the facilitating or debilitating effects of the tester on the testee. One dimension of tester difference was deliberately introduced; each child was tested by an examiner representing the child's own cultural group in order to (1) maximize chances of establishing constructive rapport, (2) permit the administration of instructions and test items in the child's primary language, in English, or in the most effective combination of languages for the particular child. This procedure, however, introduced full confounding between examiner and subject differences. The following steps were taken to reduce the effects of this confounding.

While certain matters pertaining to the testing atmosphere were left to the examiner's discretion, instructions for test administration were prescribed in great detail (see Appendix A). No formal steps in testing remained at the examiner's option or discretion; all procedures and verbal statements were directed by the test administration instructions. Testers were then trained to administer the tests in this standardized, uniform manner. Intensive training in uniform practice was conducted and will be described in detail later. A possible statistical control on the degree of uniformity of practice thus achieved was considered. This plan called for the testing of a common group of children by all testers. Even this procedure, however, would not yield unequivocal information about the degree to which standardized practice had been achieved since practice effects and examiner-subject interactions would render the interpretation of such data questionable.

Thus, every effort was made in both test construction and tester training to create absolutely uniform administration. Independent information exists to indicate that such uniformity was present at the end of the training sessions. Since no independent evidence exists, however, to indicate the degree to which uniformity was succesfully maintained during the testing sessions themselves, examiner differences must be regarded as confounded with subject differences.

IV. Test demands:

(A) Specific abilities required:

No reading or writing was required of the child. Understanding the requirements of the tasks was insured by stating directions (and the test questions as well) as simply as possible in the best combination of languages for the particular child, by using extensive sample materials, and by allowing examiners to repeat sample items until certain that the task is comprehended. The S could respond in any combination of languages suitable to him. Thus, elements such as differences in reading or writing ability and facility with the use of the English language when supplying answers, were physically controlled.

(B) Speed of response required:

Sufficient attention has been given the role of speed of response in test performance to deserve separate discussion as a specific ability called for in the test situation. Numerous references (e.g., Davis, 1948; Klineberg, 1928; Murray, 1960; Riessman, 1962) have been made to the special disadvantages for measured mental abilities of cultures which place little accent on speed in conducting daily activities. Klineberg (1928) described S's who could see no reason to hurry through a task, especially if it seemed congenial and interesting. Riessman (1962) asserts that the typical intellectual functioning of "culturally deprived" children is not inferior to, but only slower than that of other children. To physically control the variable of speed in this research, power tests were used throughout. While general time limits were placed in a few instances, these were extremely liberal (see Appendix A) and were adopted merely to prevent the total testing time from becoming unrealistically extended. Under no circumstance was the child's test performance inhibited due to lack of time.

The status in this research of each test influence discussed above is summarized in Table 1.

Table 1

Summarization of Variables Affecting Test Performance Which are under Substantive Study, Physically Controlled, Statistically Controlled, Uncontrolled, or Confounded

Variable	Classification
I. Background and experience:	
A. Cultural background	Under substantive study
B. Family characteristics	Under substantive study and statistical control
C. Formal school training	Physical and statistical control
D. Test-taking experience	Physical control
E. General health and special handicap	Physical control
F. Age	Physical and statistical control
II. Personality and motivation:	
A. Persuasibility	Statistical control
B. Interest in test problems	Physical and statistical control
C. Effort and persistence	Physical and statistical control
D. Anxiety	Uncontrolled
E. Achievement motivation	Uncontrolled

Table 1 (cont'd)

III. Situation:	
A. Perceived importance of test	Statistical control
B. Expectations of success or failure	Uncontrolled
C. Temporary physical conditions	Physical control
D. Interference from testing environment	Physical control
E. Influence of the tester	Confounded
IV. Test demands:	
A. Specific abilities	Physical control
B. Speed	Physical control

C. Sample selection:

Subjects were 320 first grade children, age 6 years, 2 months, through 7 years, 5 months, 80 from each of four cultural groups (Jewish, Negro, Chinese and Puerto Rican). Each cultural group was subdivided into 40 children of middle class and 40 of lower class status. The 40 children in each social class category within each cultural group were further subdivided into 20 girls and 20 boys. Thus, a 4 x 2 x 2 analysis of variance design was used (4 Cultural Groups x 2 Social Classes x 2 Sex Groups), each of the 16 cells containing 20 S's. All S's were drawn from public schools in New York City and its surrounding environs.

Even within a population as large as that of New York City, serious problems were encountered in locating and classifying cases which clearly met the three-fold criterion (cultural group, social class, and sex) used in this study.

1. Cultural Group:

The first technical problem is that of establishing a sufficiently precise definition of cultural group membership to permit unequivocal classification of cases. The variable of cultural group membership has not as yet acquired precise scientific definition; the evident multidimensional character of cultural group membership demands analysis of its many components before it can be used with precision in scientific research. Despite the current limitations of the concept, there are extensive precedents for its scientific use (e.g., Harding, Kutner, Proshansky, and Chein, 1954; Hsu, 1961; Kaplan, 1961; Kluckhohn, 1954; Lindzey, 1961; Spindler, 1963; Whiting, 1954; Whiting and Child, 1953; Whiting and Whiting, 1960). By "cultural group" we mean a "collection of people considered both by themselves and by other people to have in common one or more of the following characteristics: (a) religion, (b) racial origin (as indicated by identifiable physical characteristics), (c) national origin, or (d) language or cultural traditions." (Harding, Kutner, Proshansky, and Chein, 1954, p. 1022.)

Despite the very general nature of this definition, the classification of children according to cultural group in this research was surprisingly straightforward. This was probably a function of the facts that (1) the cultural groups studied in New York City (Jewish, Negro, Chinese and Puerto Rican) are relatively distinct and discrete, and (2) since we were seeking to identify children from maximally homogeneous areas containing concentrations of families from particular cultural groups, once a school was located which was relatively unintegrated and heavily populated by a single cultural group, many children could be identified simultaneously, (although confirmation was, of course, necessary.)

A second technical problem in determining cultural group placement is that of locating information, while remaining within the legal regulations imposed upon securing such data. To obtain sufficient data, information from many community agencies was used to confirm the cultural group placement. A list of these agencies follows:

1. New York City Planning Commission (Population Analysis Division)
2. New York City Bureau of Public Health
3. New York City Regional Planning Association
4. Federation of Jewish Philanthropies (Demographic Study Committee)
5. Community Council of Greater New York
6. Protestant Council of the City of New York
7. Commonwealth of Puerto Rico
8. China Institute of America
9. Camp Sussex
10. Community Service Society (Department of Public Affairs)
11. New York City Department of Child Welfare
12. New York City Department of Welfare
13. New York City Youth Board
14. New York City Housing Authority
15. New York State Division of Intercultural Relations in Education
16. New York University (Research Center for Human Relations)

17. Columbia University (Bureau of Applied Social Research, New York School for Social Work)
18. New York Times Advertising, Promotion and Research Departments
19. New York News Advertising and Promotion Departments
20. Mobilization for Youth, Inc.
21. Batten, Barton, Durstine and Osborn, Inc.
22. United States Department of Commerce, Census Bureau
23. United States President's Committee on Delinquency and Youth Crime

Data concerning cultural group placement derived from these sources was supplemented with all the information which could be obtained legally through school authorities and teachers. Parents were not approached directly. Additional confirmation was available in the following valuable sources:

1. U.S. Department of Commerce, Bureau of the Census:
   "U.S. censuses of population and housing: 1960, New York, N.Y. (Standard Metropolitan Statistical Area), Part 1, New York City."
2. New York City Youth Board:
   "Indices of social problems: selected socio-economic characteristics of New York City by borough and health area, 1962."
3. New York City Housing Authority:
   "Project statistics, June 30, 1962."
4. Community Service Society (Stuart H. Cattell):
   "Health, welfare and social organization in Chinatown, New York City, August 1962."

One criterion used in the selection of children was that both parents be identified with the same cultural group, although not necessarily the same birthplace. Our original intention was to follow a second criterion of limiting selections to those children born in the United States. This was not feasible, however, due to the small number of children available in certain social class and cultural group categories. The birthplaces of the children are presented in Table 2, fathers' birthplaces in Table 3, and mothers' birthplaces in Table 4.

Information was obtained from the children and (when available) their parents concerning the language spoken at home; Table 5 presents these data.

Table 6 lists the language spoken by the child during the test sessions.

Although the classification of children for cultural group was relatively direct, a few local problems were encountered:

(A) There has been a recent influx into New York City of families from Cuba, the Dominican Republic, and Venezuela; none of these families were included in the present study. Since some Puerto Ricans view membership in these other Latin or South American groups as a source of greater prestige than Puerto Rican identity, and sometimes claimed membership in these groups, an element of confusion was introduced. No child was included in our sample whose parents were not explicitly described as Puerto Rican.

Table 2

Birthplace of Children by Cultural Group (Chinese, Jewish, Negro, Puerto Rican), Social Class (Lower and Middle), and Sex (Girls and Boys)

Child's Birthplace	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Midlle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
New York City and environs	19	16	13	13	19	19	17	18	17	18	16	18	13	13	15	17
U.S. (other than N.Y. State)		2	1	3	1	1	1	1					1			
South									1	2						
North, West									2		4	2				
Israel							2									
Poland								1								
Hong Kong	1	2	3	3												
Taiwan			3	1												
Puerto Rico													6	7	5	3

Table 3

Birthplace of Fathers by Cultural Group (Chinese, Jewish, Negro, Puerto Rican), Social Class (Lower and Middle), and Sex (Girls and Boys)

Father's Birthplace	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
New York City and environs			2		10	12	9	15	4	2	5	5			1	1
U.S. (other than N.Y. State			2	5	5	4	2	3								
State not given											3	6				
South									12	12	4	4				
North, West									3	1	4	2				
Poland					2	3	1	1								
Russia					2		2									
Austria					1		1									
Germany						1	2									
Israel							1									
Canada							1									
Hungary							1									
France								1								
British West Indies										1	2	3				
British Honduras											1					
China (including Hong Kong and Taiwan)	20	18	15	15												
Puerto Rico													20	20	19	19
No Information		2	1						1	4	1					

Table 4

Birthplace of Mothers by Cultural Group (Chinese, Jewish Negro, Puerto Rican) , Social Class (Lower and Middle), and Sex (Girls and Boys)

Mother's Birthplace	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
New York City and environs	1	1	2	1	10	12	11	14	2	3	4	4				2
U.S. (other than N.Y. State)			4	2	6	5	3	4								
State not given											3	6				
South									11	10	9	5				
North, West									2		2	2				
Poland					1	1		2								
Austria						1	1									
Germany					1		2									
Israel							1									
Canada							1									
Czechoslovakia					1											
Roumania						1	1									
British W. Indies											1	3				
Virgin Islands										1						
China (including Hong Kong and Taiwan)	19	18	13	16												
Hawaii			1	1												
Puerto Rico													20	20	20	18
No Information		1			1				5	6	1					

Table 5

Language Spoken at Home for Each Cultural Group (Chinese, Jewish, Negro, Puerto Rican), Social Class (Lower and Middle) and Sex (Girls and Boys)

Language at Home	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
English			3	6	18	19	18	19	20	20	20	20				1
Eng. and Yiddish					2	1										
Eng. and Hebrew							1									
Hebrew							1									
Eng. and Polish								1								
Eng. and Chinese	8	6	10	7												
Chinese	12	13	7	6												
Eng. and Spanish													3	1	10	11
Spanish and some Eng.													9	11	9	8
Spanish													8	8	1	
No Information		1		1												

Table 6

Language Used by Child during Test Sessions by Cultural Group (Chinese, Jewish, Negro, Puerto Rican) , Social Class (Lower and Middle), and Sex (Girls and Boys)

Child's Language During Test	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
English	7	2	7	13	19	20	18	19	20	20	20	20			4	1
Eng. and Yiddish					1											
Eng. and Hebrew							2									
Eng. and Polish								1								
Eng. and Chinese	8	13	10	5												
Chinese	5	5	3	2												
Eng. and Spanish													5	2	6	14
Spanish and some English													7	14	10	4
Spanish													8	4		1

(B) In certain sectors of New York City, some Negroes value Puerto Rican identity above their own. Some young Negro children acquire a small Spanish vocabulary and then classify themselves as Puerto Rican. Again, no Negro child was included whose parents were not explicitly described as Negro.

(C) The Jewish classification is perhaps the least unitary of all the cultural groups studied. Had various orthodox Jewish religious groups been studied (e.g., the Hassidic group in Williamsburg, Brooklyn), greater homogeneity would have been obtained, but the great majority of such children attend private religious schools. Our criterion was simply whether or not the child was born to two Jewish parents. Since degree of religious or social commitment could not legally be determined, considerable heterogeneity of cultural conditions is to be expected within this group.

(D) Within the Chinese population of New York City, a multitude of places of origin and language dialects is represented. Among the three Chinese testers used in this research, four of the major dialects were represented. Information regarding background and history was most difficult to obtain for the Chinese group; many Chinese suspected that we represented the immigration authorities and that the information would be used against them in some way.

2. Social Class:

The definition and measurement of social class position presented perhaps the most troublesome problems for this research. Unequivocal definition is difficult to achieve, and once the criteria have been established, legal restrictions do not permit obtaining all the necessary information about them.

Although the assessment and interpretation of social class characteristics have been studied for many years, no generally adopted conceptualization or measurement device has emerged. Social class has been variously viewed as a way of life, the exercise of power over persons and resources, reputation and esteem, or a composite of objective properties such as occupation, education and area of dwelling (Barber, 1957). Typical conceptualizations have included those of Veblen (1918) who considered consumption patterns as the primary indicator of social class, Warner and Lunt (1941) who defined it in terms of other people's judgments of a family's prestige and esteem and Centers (1949) who defined social class primarily as the person's self-judgment.

The use of objective properties of a family's position followed Warner's early effort to use community informants to assess social class status. Because this system proved to be too cumbersome for extensive use, the Index of Status Characteristics was developed (Warner, Meeker and Eells, 1949). This index, designed to estimate or reflect community prestige ratings, is based upon the sum of weights assigned to occupation, dwelling area, house type and source of income.

A modification of this objective scale was developed by Hollingshead and Redlich (1958) for use in a community which (except for its size) shares the urban heterogeneity of New York City. This Index of Social Position uses the criteria of occupation of family head (weighted 9), residence (weighted 6), and education of family head (weighted 5); five class categories (I-V) are thus obtained. The Index of Social Position was employed in this research.

Before describing the information obtained regarding these criteria, the designation of "family head" must be elaborated. It would have been possible to study only intact families with both mother and father present in the home; this procedure, however, would have severely biased the selection of cases in certain social class and cultural groups (e.g., lower class Negro) in which, according to the community sources mentioned earlier, a great number of families are not intact. Instead, in order to obtain more representative sampling, all families were used, whether or not both parents currently resided in the home, if the criteria of occupation, residence and education were met. Where the father was not in the home, the mother was considered "family head", and social class placement was based upon her occupation, residence and education. The marital status of the families is described in Table 7.

The occupations of family heads classified according to Hollingshead and Redlich's occupational categories (1958, pp. 390-391) appear in Table 8.

Educational levels, especially for the lower class groups, could not always be exactly ascertained. The best estimates, derived from combined information from the child, the school, or (sometimes) the parent, are presented in Table 9, categorized according to the Index of Social Position (Hollingshead and Redlich, 1958, p. 391). Equivalent foreign educational levels are included with education obtained in the United States.

Following the procedures of Hollingshead and Redlich, a six-position residential scale was used ranging from the "finest homes" to the "poorest tenements" (1958, p. 390). Although it was

Table 7

Marital Status of Parents by Cultural Groups (Chinese, Jewish, Negro, Puerto Rican), Social Class (Lower and Middle) and Sex (Girls and Boys)

Marital Status	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
Married and Living Together	20	20	20	20	19	20	19	18	12	9	20	17	16	18	20	20
Unmarried and Living Together									3	2						
Separated: Child Lives with Mo.					1		1	1	3	5			4	1		
Divorced: Child lives with Mo. and Stepfather								1		1		3				
Divorced: Child lives with Fa. and Stepmother									1							
Fa. deceased: Child lives with Mother										1						
Mother deceased														1		
Marital status Unknown									1	2						

Table 8

Occupation of Family Head by Cultural Group (Chinese, Jewish, Negro, Puerto Rican), Social Class (Lower and Middle) and Sex (Girls and Boys)

Occupation of Family Head	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
Category I:																
Medical Doctor							2									
Dentist								1			1					
College Prof.			2	1			1	1								
Lawyer							1	3			1	2				
Economist			1													
Psychiatrist								1								
Engineer			1	4			2									
President of large business							1									
Import, export business			1	1												
Total I:	0	0	5	6	0	0	7	6	0	0	2	2	0	0	0	0
Category II:																
Elem. H.S. Teach.			1				1				2	7				1
Psychological Consultant							1									
Minister												1				
Accountant				1			1									
Chief Detective											1					
Graduate Student			1				1				1					
Newspaper Writer											1					
Musician				1			2	2			3					
Actor																1
Designer							2	1								1
Writer								1			1					
Social Worker								1			1					
Pharmacist																1
Stockbroker			1				1	2								
Chemist				1												
Editor								1								
City Planner								1								
Statistician								1								
Business Manager			1	2				1			1	1			2	
Total II:	0	0	4	5	0	0	9	11	0	0	11	9	0	0	2	4

Table 8 (cont'd)

Occupation of Family Head	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
Category III:																
Public Relations							1				1					
Medical Tech.											2				1	
Buyer								1							1	
Advertising Exec.							1									
Ship Dispatcher											1				2	
Army Officer												2				
Medium Business: Owner			6	8			1	2				3			5	3
Photographer																2
Bus. Off. Supv.			1									1				
Post Off. Supv.											1	1			1	1
Airlines Supv.			1													
Total III:	0	0	8	8	0	0	3	3	0	0	5	7	0	0	10	6
Category IV:																
Aircraft Tech.											1				1	4
Electrician										1					1	1
Clerk	1	1			2	2			1				1		2	
Sales	1	1	1		1	2				1		1			1	1
Postman												2				
Policeman					1					1						
Small Business: Owner			2	1	2		1				1					
Total IV:	2	2	3	1	6	4	1	0	1	3	2	2	1	0	5	6

(cont'd)

Table 8 (cont'd)

Occupation of Family Head	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
Category V: Skilled Worker (e.g., mechanic, dyemaker, glazer, carpenter, cook, tailor.)	6	6			5	6			4	4			2	1	3	4
Category VI: Semiskilled Worker (e.g., counterman, elevator op., presser, waiter, laundryman, construction worker.)	10	10			5	5			6	9			15	14		
Category VII: Unskilled Worker (e.g., handyman, watchman, messenger, dishwasher.)	2	1			2	3			6	3			1	3		
Unemployed		1			2	2			3	1			1	2		

not legally possible to inspect the inside of the houses or apartments, each residence was visited by a project staff member and a scale score assigned. Many middle class families in our samples reside in "middle-income" housing projects which place no income limits; these residences were almost uniformly placed in category II. Several families in our samples live in low-income housing projects (cf., New York City Housing Authority, Project Statistics, June 30, 1962) in which income limits are maintained; these residential areas were placed either in category IV or V depending upon the apparent quality of maintenance, the characteristics of the neighborhood, and the rental charge per room. The residence data are presented in Table 10.

All data on occupation, education and residential area were confirmed, as far as possible, through the twenty-three community agencies and four sources of census and housing statistics (Federal Census, New York City Youth Board, New York City Housing Authority, Community Service Society) described as offering confirmation of cultural group placement.

The Index of Social Position scores were computed from the occupation, education and residential area data described in Tables 8 - 10. These Social Position Index scores appear in Table 11.

It is clear from the data on Index of Social Position presented in Table 11 that it was not possible to maintain an equal degree of separation between social class groups for each cultural group. Jewish and Negro social class groups are both separated by the absence of cases in Class III, for the Chinese there is only one

Table 9

Educational Level of Family Head by Cultural Group (Chinese, Jewish, Negro, Puerto Rican), Social Class (Lower and Middle), and Sex (Girls and Boys)

Education of Family Head	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
I. Graduate Professional Training			4	2			6	5			4	3				
II. Std. College or Univ. Graduation			8	5			12	15			7	9			4	3
III. Partial College			2	6	1	1	2				6	3			1	8
IV. High School Graduation	1		6	7	5	5			1	2	3	5			15	8
V. Partial High School	2				7	6			1	1			3	2		1
VI. Junior High School	1	1			4	2			1				1	2		
VII. Less than 7 years of school	16	19			3	6			17	17			16	16		

Table 10

Residence Scale Scores by Cultural Group (Chinese, Jewish, Negro, Puerto Rican), Social Class (Lower and Middle), and Sex (Girls and Boys)

Residence Scale Scores	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
Category I: Exceptional construction & maintenance			2	1			6	5			3	4				
Category II: Excellent construction & maintenance			8	10			11	12			9	8			7	6
Category III: Good construction & maintenance			6	8	2	1	3	3			5	5			10	11
Category IV: Fair construction & maintenance	1		4	1	6	5			2	1	3	3			3	3
Category V: Poor construction & maintenance	4	6			6	8			10	11			9	7		
Category VI: Poorest construction & maintenance	15	14			6	6			8	8			11	13		

Class III case, but for the Puerto Ricans the highest social class families which could be located fell into Classes II and III. Neither was it possible to maintain homogeneity of class position across cultural groups. Thus, the Jewish middle class cases are mainly Class I, Negro and Chinese middle class cases are mostly Class II, and Puerto Rican middle class are mostly Class III. A somewhat similar situation exists for lower class placement across cultural groups; Jewish lower class cases are equally divided into Classes IV and V, while the Negro, Chinese and Puerto Rican lower class are almost all Class V. Thus, neither the middle class nor lower class categories are homogeneous across cultural groups.

An alternative strategy for the selection of social class cases had been considered. This plan would have maintained homogeneity for social class position across cultural groups by holding social class position constant across cultural groups at the lowest common denominator. This would mean that if the highest social class positions available for the Puerto Rican group fell into Classes II and III (see Table 11), then Class II and III cases only would be included for the other cultural groups; similarly, if the lower social class positions available for the Jewish group were equally divided between Classes IV and V (see Table 11), then an identical distribution of cases would be included in the other cultural groups.

The disadvantages of this approach are apparent. It would force the selection of social class cases which are not authentic for a particular cultural group. Class III cases are not authentically "middle class" among the Jewish population of New York City, nor are Class IV cases truly "lower class" among Puerto Ricans.

Table 11

Index of Social Position by Cultural Group (Chinese, Jewish, Negro, Puerto Rican), Social Class (Lower and Middle), and Sex (Girls and Boys)

Index of Social Position	Chinese				Jewish				Negro				Puerto Rican			
	Lower		Middle		Lower		Middle		Lower		Middle		Lower		Middle	
	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B
Class I			3	4			14	13			4	3				
Class II			16	16			6	7			16	17			7	7
Class III			1												13	13
Class IV	1	1			11	9			2	2			1			
Class V	19	19			9	11			18	18			19	20		

Therefore, at the risk of introducing the heterogeneity in social class position across cultural groups depicted in Table 11, a strategy was adopted of maximum separation between the social classes for each cultural group. If the greatest separation currently available for Puerto Ricans compared middle class cases in Classes II and III with lower class cases in Class V, while the greatest separation for Jewish groups existed between a middle class composed of Classes I and II and a lower class divided between Classes IV and V, then these comparisons, providing maximum separation for each cultural group were made.

In further defense of the strategy followed, it should be noted that no overlap whatever exists between middle and lower class groups within any cultural category. Puerto Rican samples show the smallest degree of separation between social class groups, but even here no middle class case has an Index of Social Position which approaches the Index of any lower class case (the highest Index among middle class being 80 and the lowest Index among lower class being 101).

The implications of this procedural strategy for selecting social class cases will be discussed further in the data analysis and interpretation sections of this report.

It was noted earlier that locating and classifying children by cultural group was relatively direct. However, when the criteria of social class were added to cultural group criteria, numerous special problems arose. Few difficulties were encountered in

Manhattan in locating lower-class Negro families (Central Harlem), lower-class Chinese (Chinatown), lower-class Puerto Ricans (East Harlem, Lower East Side), or middle-class Jewish families (Inwood, Washington Heights, Greenwich Village, Central Park West, Morningside Heights). It was necessary, however, to go outside the borough of Manhattan to locate sufficient numbers in the other groups.

Some lower-class Jewish families (N=6) were located on the lower East Side in Manhattan, but the majority of lower-class Jewish families (N=34) were located in the Williamsburg and East New York districts of Brooklyn. Many middle-class Negro families (N=22) were found in the Sugar Hill, Washington Heights, and Morningside Heights areas in Manhattan, but this sample was supplemented with middle-class Negro families from the Gun Hill and Baychester sections of the Bronx (N=7) and from New Rochelle (N=11). The majority of middle-class Chinese families (N=28) were found in Greenwich Village, Morningside Heights, and Chinatown in Manhattan, but the Jamaica and Forest Hills sections of Queens (N=7), Riverdale in the Bronx (N=2), and Teaneck, Tenafly and Ridgewood districts in Northern New Jersey (N=3) provided additional samples. Middle-class Puerto Rican families (N=30) were found in Manhattanville, Washington Heights, Central Park West in Manhattan; additional samples (N=10) were found in the Castle Hill section of the Bronx. A rather thorough search of the communities neighboring New York city did not reveal any greater concentrations of Puerto Rican families who more clearly met the middle-class criteria.

In attempting to establish both cultural group and social class distinctions, the question of the conceptual and measured independence of these two variables should be considered. It has been pointed out (e.g., Hoffman and Lippitt, 1960) that ethnic background and race have sometimes been considered as aspects of social class. Recent evidence (e.g., Barber, 1957; Bloom, Whiteman and Deutsch, 1963; Hollingshead and Redlich, 1958) indicates an orthogonal relationship between these variables, suggesting that ". . . the community social structure is differentiated vertically by racial, ethnic, and religious factors, and horizontally by a series of strata or classes," (Hollingshead and Redlich, 1958, p. 388.)

D. The Tests of Mental Ability:

1. General Considerations:

When this study was proposed, it was intended that some modification of the Hunter College Aptitude Scales for Gifted Children (Davis, Lesser, and French, 1960) would be utilized. It was recognized that the original scales were designed to be used primarily with gifted children; however, the age range of children to whom the earlier tests were given was from about 4 years to 5 1/2 years. It was, therefore, considered likely that many of the items on the scales would serve quite well in measuring a random sample of children 6 to 7 1/2 years old. Hence, the first step in the construction of the tests used in this study was to examine with considerable care the content and the statistical characteristics of the items included in the nineteen subtests of the five scales developed in the previous study (Davis, Lesser, and French, 1960, pp. 19-24).

Certain decisions were made as a result of this analysis of the subtests. The four scales retained for use were the Vocabulary, Reasoning, Number, and Space Conceptualization. The Science test used in the earlier study was excluded on the grounds that it was too highly correlated with Reasoning, Space, and Vocabulary.

Certain aspects of the original scales precluded or diminished their usefulness in the present study:

(A) The Picture Recognition subtest (of the earlier Vocabulary Scale) was considered to be too "pretty" a test. All the pictures were quite colorful and rather precious. They were excellent items for attracting the interest of young children, but were less suitable for the present purpose of testing children from several social class and cultural backgrounds.

(B) The vocabulary level of the Definitions subtest (of the original Vocabulary Scale) was deemed to be too difficult in spite of the fact that older children were included in the present study. This conclusion was based upon evidence obtained in tryout of some of the items from the scale. In addition, the Definitions subtest had not been constructed originally with the aim of being suitable to measuring class or ethnic group differences. This consideration is discussed further in the section on the current Verbal Scale.

(C) The pictorial material utilized in the Picture Analogies and Picture Arrangements subtests (of the earlier

Reasoning Scale) resembled the pictures in typical children's books aimed at middle-class consumers, and therefore, required modification.

(D) The Verbal Analogies subtest (of the earlier Reasoning Scale) was eliminated as being too heavily loaded on verbal ability and too difficult for our population.

(E) As all four subtests of the earlier Number Scale (addition, subtraction, multiplication and division) required the use of symbols (+, -, x, and ÷), it was decided to cast the measurement of these abilities into an entirely different mold which did not require the use of these symbols. It was also decided to add an Enumeration subtest to the Numerical Scale in order to measure a most elementary numerical skill.

(F) The Hidden Pictures, Cubes, Roll-Up, and Judging Sizes subtests (of the earlier Space Scale) were eliminated as being either too difficult or too easy for our population without extensions of their ranges of difficulty. These extensions of difficulty level were impracticable or virtually impossible to accomplish. For example, the earlier Judging Size subtest was too easy for our population, but the inclusion of more difficult items would have required an elaboration of materials, both in quantity and size, that would have been costly and cumbersome. The Cubes Test had proved to be quite difficult for the gifted group, and the nature of the test was such that all of the easiest possible items had already been included.

(G) The form of the Perspective subtest (of the earlier Space Scale) made it rather cumbersome to administer, and the items had proved to be quite difficult. However, it was decided to retain this subtest in a modified form.

(H) The Jump Peg subtest of the original Reasoning Scale and the Object Completion, Jigsaw Puzzles and Estimating Path subtests of the original Space Scale were usable with very little modification.

The final form of the scales used in this study included the following subtests and numbers of items. It should be noted that certain minor changes were made in the names of some of the earlier scales and subtests. Also the numbers of items in certain subtests were increased. Specific directions for administering and scoring items in each subtest are presented in Appendixes A and B.

Scale	Subtests	Number of Items	
Verbal	**Picture Vocabulary**	**30**	
	Word Vocabulary	**30**	
			60
Reasoning	**Picture Analogies**	**18**	
	Picture Arrangement	**16**	
	Jump Peg	**12**	
			46
Numerical	**Enumeration**	**6**	
	Addition	**10**	
	Subtraction	**10**	
	Multiplication	**10**	
	Division	**10**	
			46
Space	**Object Completion**	**16**	
	Estimating Path	**12**	
	Jigsaw Puzzles	**16**	
	Perspective	**10**	
			54

Other general considerations regarding the scales and their administration follow: (1) The tests required of the S neither reading nor writing ability; (2) directions were kept extremely simple; (3) the test could be administered in English or in the child's primary language, or in any combination of the two -- this was frequently necessary for the Puerto Rican and Chinese children but seldom necessary for the Jewish children (see Table 6, p. 46); (4) ample practice material was provided prior to each subtest and examiners were instructed to proceed with scored items only when certain that the child was familiar with the material and understood the task; (5) there were no formal steps of test administration left to the discretion of the examiner; each step was specified in detail to assure standard procedure.

Precautions that are usually taken in the administration of individual psychological tests were observed. No child was tested if he was unwilling (though this was extremely rare in our experience). If a child was suffering from a transient disturbance (such as a cold) testing was postponed. If a child showed symptoms of fatigue, the examiner was instructed to stop testing and continue another day. In addition to the usual precautions, the examiners were alert to the possibility that a child might suffer from a physiological or emotional disturbance that was more than transient. If the examiner's impression was confirmed by school personnel, the child was not included in the study.

With the exception of four middle class Chinese children who were obtained to fill out the sample after the public schools had closed for summer vacation, each child was tested in a room in his own public school during regular school hours. There was some variety in the individual setting in which the tests were administered, as one might expect in a study conducted in a variety of sections of a large city. As guests in a school, it was our wish to comply with their rules, understand their needs, and complicate their routines as little as possible. Each child was, however, tested in a room in which he was alone with the examiner. As mentioned earlier, examiners were instructed to terminate the testing if there was any evidence that limitations of space, interruptions, or noise, were interfering with the child's performance.

The length of the testing period varied and was determined primarily by the examiner's judgment regarding degree of rapport and fatigue. Most commonly, a child was seen for one session on each of three separate days for thirty to forty-five minutes. The series of sessions was always completed within four weeks to control possible variance due to age difference (although age differences were controlled statistically in the analysis of covariance design).

While there was a standard sequence in which the subtests and items were to be administered, the examiner could stop after any subtest and continue on another day. This degree of flexibility was demanded by such factors as fatigue described above.

The required sequence of the subtests and the suggested division by session is as follows:

First Session

Picture Vocabulary
Persuasibility I
Word Vocabulary I
Picture Analogies

Second Session

Cancellation
Picture Arrangement
Jump Peg
Numerical
Word Vocabulary II

Third Session

Object Completion
Jigsaw Puzzles
Estimating Path
Perspective
Persuasibility II
Interest Measure

Regardless of how many subtests were completed the first session, the Cancellation subtest was administered at the beginning of the second session.

Examiners presented the tasks with a "game" orientation and tried to make them as pleasant as possible for the child. Each examiner was instructed, however, to change the orientation to a more serious one if the child seemed more comfortable and productive when dealing with "work." As is frequently the experience in conducting research with young children in a school setting, our subjects generally responded positively to the experiment, and our greatest rapport problem was in resolving the disappointment of those children in a classroom who were not to be included in our study.

2. The Mental Ability Scales:

The definitions of the four mental abilities studied are as follows:

Verbal Ability: This skill is defined as memory for verbal labels in which reasoning elements, such as those required by verbal analogies, are reduced to a minimum. Verbal ability has long been regarded as the best single predictor of success in academic courses, especially in the language and social science fields. It is involved to a marked degree in the work of all professions and most of the semi-professional areas.

Reasoning: This involves the ability to formulate concepts, to weave together ideas and concepts, and to draw conclusions and inferences from them. It is, almost by definition, the central element of aptitude for intellectual activities and therefore is of primary importance in all academic fields and in most vocations.

Number Ability: This is defined as skill in enumeration, and in memory and use of the fundamental combinations in addition, subtraction, multiplication, and division. It is of great importance in arithmetic in elementary schools and mathematics in secondary schools.

Space Conceptualization: This refers to a cluster of skills related to judging spatial relationships and sizes of objects, and in visualizing their movements in space. It is involved in geometry, trigonometry, mechanics, and drafting, in elementary school activities such as practical arts and drawing, and in occupations such as mechanics, engineering, and architecture.

(A) The Verbal Scale:

The Verbal Scale consists of thirty Picture Vocabulary items and thirty Word Vocabulary items. The latter subtest was administered in two parallel forms of fifteen words each. The two forms were administered at separate testing sessions. This technique was employed with the Word Vocabulary partly because of the length of time required to administer this test and partly to obtain a more rigorous estimate of the reliability of the test.

(1) Picture Vocabulary: As was indicated earlier, the Picture Vocabulary test was revised considerably from the form it took in the earlier scale. It was decided that this subtest should be extended considerably as it was felt that the measurement of verbal concepts in terms of a child's observation of his environment would be less contaminated by the sort of naming behavior that allegedly takes place in a middle-class environment. The items selected, then, should be items that would necessarily be represented in the environments of all urban children in the population we would sample. Naturally, we drew primarily upon the urban areas of New York City, although it is felt that the materials ultimately utilized in this test would probably be equally appropriate for any metropolitan area in the United States. The items selected were chosen on the basis of their visibility to any child regardless of where he might

live in an urban culture. A definite attempt was made to avoid the sort of rural emphasis that is prevelant in many of the group intelligence tests now in use in the United States. In the pictorialization of the items, the artists were instructed to make their drawings of people neutral in tone and to include a minimum of the frills often associated with the pictures that appear in popular children's books. The Picture Vocabulary items are indicated in the examiner's blank included as Appendix B of this report. They consisted of eighteen pictures of people and objects which the subject was asked to name and twelve pictures of activities which the subject was asked to identify. A weighted scoring key was developed for this test so that the possible range of scores was from 0 to 60.

(2) Word Vocabulary: The development of the Word Vocabulary Test entailed the greatest difficulty in test construction for this study. Extended tryout of words was necessary to meet the following criteria:

(1) No word unknown by a large percentage of either middle or lower-class children during tryout was used.

(2) No word unknown by a large percentage of one or more of the ethnic groups during tryout was used.

(3) No word known only by a large percentage of either middle or lower-class children was used.

(4) No word known only by a large percentage of three or fewer ethnic groups was used.

(5) Only words were used with suitable equivalents in Spanish, Chinese and Yiddish indicating the same verbal concepts at approximately the same difficulty level for children of ages six to seven and one half years.

Numerous words were selected and grouped into categories of nouns, verbs, adjectives, and a limited number of adverbs (of very frequent usage in terms of word counts in the Lorge-Thorndike Word List). The psychologists representing each of the ethnic groups in this study then analyzed the list to determine whether or not each word had a counterpart in the native language of the ethnic group -- Spanish for Puerto Ricans, Chinese, of course, for the Chinese, and Yiddish for the Jewish group. They attempted further to determine if each translated word would be of a difficulty approximately equivalent to its difficulty level in the American usage of the English word.

During a tryout period, English words were then translated into Spanish and then independently translated from Spanish back to English to see whether or not the resulting English words were the ones that we started with. This procedure was successful in producing quite an extensive list of words that were suitable for testing the Puerto Rican children. The success of this procedure for the Puerto Rican children was crucial to this study because seventy-five of the eighty Puerto Rican children were tested either in Spanish exclusively or in some combination of Spanish and English (see Table 6, p. 46).

With the Chinese group, it was difficult to follow the same procedure since there are at least two or three Chinese dialects used in New York City. In the group we sampled, we found primarily the Cantonese dialect, but also other dialects of southern China. Among the middle-class Chinese, we found either the Mandarin or Shanghai dialect if Chinese was spoken at all. The resolution of this situation was the most difficult problem in developing the Word Vocabulary subtest. The attempted solution was to locate consultants who spoke both English and Chinese and who were familiar with the local urban conditions in New York City. They proposed the verbal concept in Chinese which most closely represented each English word and which could be expected to be known by a Chinese child of normal ability, at about the same age as an American child would know this same concept. Extensive tryout of these Chinese words was then conducted.

A second obstacle arose in building an equivalent list of Chinese vocabulary words due to the fact that the only possible translations of certain words into Chinese demanded that they be placed in a verbal context. For example, the word "shade" in Chinese has no meaning by itself and is accompanied by a modifier such as "tree-shade," "lamp-shade," etc. The only possible way of scoring responses to these items would be on the basis of the child's ability to use the word in a context and this was not the verbal skill we were attempting to assess through the Word Vocabulary Test. Thus, many additional words had to be discarded.

A final criterion for retention of a Chinese word in the vocabulary list was that the word could also be assigned an equivalent translation in Mandarin and Shanghai dialects as well as in the Cantonese.

As a result of these efforts, the Word Vocabulary list seems fair for comparing Chinese children with English-speaking children. It is not known precisely whether or not this development of the subtest had any detrimental effect upon its efficacy for measuring verbal ability in general. However, as vocabulary tests tend to be quite highly correlated regardless of the words they contain when used for measuring English-speaking subjects, the test is probably quite suitable for the age range for which it is designed.

During the tryout of the words, it was discovered that it was not necessary to be too concerned about a careful Yiddish translation of the test. It was found that lower-class Jewish children were less likely to speak Yiddish than were the middle-class, and the middle-class Jewish children tend to be more fluent in English even if they know some Yiddish or Hebrew. Ultimately, with four exceptions, the entire sample of Jewish children was tested in English. Table 6 (p. 46) describes the languages used to assist in the testing of these four children.

Following all these procedures, it was possible to obtain a list of forty words meeting all the original criteria, passing the standards set for Spanish and Yiddish as determined by the testers and the language consultants representing these two groups, and also meeting the approval of the Chinese testers and consultants. The final thirty vocabulary words included in the test were those displaying the best difficulty levels in the tryouts with the four ethnic groups. The instability of the word lists during the tryouts precluded obtaining reliable discrimination indices. These thirty words were then divided into two matched lists based upon the composite rankings of the words made by the psychologists serving as test administrators and by the test constructors. The two lists of fifteen words each appear on the test blank reproduced in Appendix B.

(B) The Reasoning Scale:

The Reasoning subtests used in this study are more similar in content and format to those of the earlier study than any of the other subtests. The only subtest not included in the current battery was Verbal Analogies. The major changes in the items within the subtests consisted of revising the drawings for the Picture Analogies and Picture Arrangement subtests. Drawings were made with a view to minimizing the picture-book quality previously present. A further modification was the addition of more abstract drawings; that is, a number of geometrical line drawings were utilized to measure the ability to recognize various relationships outside the usual context of the picture book or story book. All items included in the Reasoning subtests are such that no naming of objects is required. If the subject can perceive the relationship involved, the correct answer can be indicated without naming any object or, indeed, without knowing the names of any of the objects in the drawings. Verbal skills are thus minimized.

(1) Picture Analogies: Each of the Picture Analogy items consists of two large cards. The first card contains three drawings, two of which are paired. The paired objects are similar and are related to each other in some way; e.g. small-large, young-old, narrow-wide, upright-turned. The second card consists of drawings of four objects similar to the third object on the first card. One of the four objects on the second card bears the same relationship to the third object on the first card as do the paired objects. The subject is required to select the analogous pair.

(2) Picture Arrangement: This subtest consists of a series of picture stories and of abstract object sequences. These series consist of from three to five drawings, each on a separate card. Each item is presented in a predetermined mixed order and the subject is asked to arrange the cards so the pictures make a good story or are in a good order.

(3) Jump Peg: This subtest consists of a specially-designed board with large holes in it (similar to a Chinese Checkers board) and several large wooden pegs. The subject is presented with a set of increasingly more difficult arrangements in the board and instructed to jump and eliminate pegs until only one peg remains and that one in the center hole of the board.

The Jump Peg subtest was retained in almost precisely the same form as was used in the earlier research. Although a certain amount of spatial visualization seems to be present in this subtest, it was retained in the Reasoning Scale with the intention of presenting sample items so that individual differences in spatial ability would be neutralized before the scored items were presented. It was expected that the obtained variance in Jump Peg scores would thus be due primarily to differences in the subjects' ability to reason.

All Reasoning items were tried out on both lower- and middle-class children of all four ethnic groups. The results of this trial suggested a weakness of the Jump Peg subtest for the current study -- that it is similar to certain children's games. It is possible that children whose families purchase this type of game have an advantage difficult to counteract completely and that this advantage applies mainly to the middle-class children. The directions for this subtest were designed to acquaint each subject so thoroughly with the procedure required before scoring began that the advantage could be minimized as much as possible. The opposite possibility of associative interference also existed; since the Jump Peg subtest resembles but is not identical to other children's games, familiarity with such games may act to confuse the child and depress his Jump Peg score. Again, the thorough directions and the use of sample items operate against such interference.

The detailed directions for the administration and scoring of these subtests (contained in Appendixes A and B) indicate the care taken in each case to be certain the subjects understand the procedure before scored items are presented.

(C) The Numerical Scale:

The Number Scale used in the earlier study of gifted children, in spite of its uniqueness and high reliability, was obviously unsuitable for use in the present study. Successful performance on the scale required not only familiarity with the basic arithmetic operations generally taught in the first two grades in school, but also knowledge of the symbols +, -, x, ÷ . The present attempt is to measure numerical concepts prior to formal training in mechanics of computation or in the operational symbols.

The resultant numerical test consists simply of two pictures: one for the Enumeration, Addition and Subtraction subtests, and one for the Multiplication and Division subtests. The former is a street scene showing houses, trees, autos, children, and other objects in quantity. The latter picture is of a fruit and vegetable stand with some children in the scene. The test items require the subject to enumerate, add, subtract, multiply and divide the persons or objects in the scene. On the enumeration subtest the subject is permitted to count with his finger actually touching the picture if necessary, as this test was introduced into the scale in order to determine the subjects' ability to count. On all other subtests the subjects were required to compute without touching the pictures.

It was recognized that there was a risk of introducing unwanted verbal variance in presenting the tests in this manner. However, the names of objects to be manipulated, the phrasing of the questions and the directions given were all put in the simplest possible language. Various versions of the specific methods applicable to each of the subtests were tested during item tryouts and the wording producing the least confusion was adopted. Furthermore, the examiner was prepared to give the entire test in the native language of the child, if necessary.

The directions for giving these tests appear in Appendix A and the specific enumerations and answers required are indicated in the test blank included as Appendix B.

(D) The Space Scale:

The original Spatial Conceptualization battery consisting of eight subtests was shortened in this version to only four. The Cubes test was dropped as it was the most difficult of all the tests for the gifted children and it was considered unlikely that enough items could be constructed to measure reliably the abilities of children in this study. The Hidden Pictures, Roll-up, and Judging Sizes subtests employed in the earlier study were discarded because they were not susceptible of extension to an easier level and their earlier reliability estimates were too low to retain them without increased length.

(1) Estimating Path: This subtest consists of twelve drawings of airplanes. Five drawings show a single plane entering a cloud and seven show two planes on intersecting routes. The drawings indicate the direction of flight of the planes. In

the first set, the subject is asked to select from four choices the point the plane will come out of the cloud if it continues on the same flight path. In the latter set, the subject selects from four options the point the flight paths of the two planes will cross.

The Estimating Path subtest was retained from the earlier battery although it tends to have a somewhat limited three-dimensional quality. As it was reasonably easy for the very gifted children, it is seemed suitable for measuring normal children. Furthermore, being a completely novel test, it is unlikely that any current children's game would bias it.

(2) Jigsaw Puzzles: Each item in this subtest consists of two identical squares, triangles or circles made of a colorful heavy plastic. One of each shape is cut into three or more pieces. The subject is required to fit the pieces together to match the uncut shape which is left in the view but out of the reach of the subject.

The Jigsaw Puzzles test was retained because it was the most successful subtest in the Space Battery utilized with gifted children. For the purposes of this study, the only change made was to utilize the easier items from the previous study. It is likely that this test yields a valid and reliable spatial-visualization factor, and is probably one of the better subtests. This proved to be the case in the study of gifted children, and the estimates of difficulty levels suggest that an appropriate set of items has been included in the current battery.

(3) Object Completion: This subtest consists of sixteen incomplete pictures of familiar objects. The subject is requested to identify each object. The list of objects appears in Appendix B.

The Object Completion subtest is less suitable for measuring spatial conceptualization than is desirable because it requires verbal identification as well as visual perception. The attempt was made to minimize the verbal component by selecting extremely simple and familiar objects (e.g., dog, spoon, and car). In addition, this subtest was scored so that even if a child could not name the object precisely, his response was marked correct if it indicated a suitable identification of the object.

(4) Perspective: This subtest consists of three large drawings, two of street scenes and one of a children's playground. Each scene contains three or four persons. The subject is asked to identify from four or five options the part of the scene a particular person would be able to see from that person's position in the scene.

The Perspective subtest provides good spatial measure if one can assume a minimum reasoning ability. To reduce the contribution of individual differences in reasoning ability, the items were designed to present perspective in its simplest form, directions were simplified as much as possible, and sample items were used.

3. Scoring of the Mental Ability Scales:

The only subtests presenting scoring problems were Picture Vocabulary, Word Vocabulary and Object Completion. For these three subtests, the examiners entered on the answer blank the entire response given by each subject whenever it was anything other than an obviously correct one. Although tentative keys had been developed based on the preliminary tryouts of the items and on the consensus of the test constructors, further information was obtained before the final keys were established. A random sample of test blanks stratified as to cultural group and social class was obtained and the responses to all items on the three subtests were tabulated. These responses were then independently keyed by three graduate assistants according to the tentative keys. Utilizing the information thus obtained the final keys were formulated listing typical responses scoring +2, +1 or 0 for each item. All of the tests were later scored independently by two psychologists and all disagreements in scoring were resolved by a third scorer.

No partial credit was given on any of the other subtests, all items being scored +1 for right and zero for wrong. Scoring forms appear in Appendix B.

4. Other Measures:

Three test influences were statistically controlled in the analysis of covariance design of this study: effort and persistence (p. 28, p. 35), persuasibility or responsiveness to the examiner (pp. 27-28, p. 35), and age of the subject (p.27, p. 35).

(A) Effort: A simple, rote cancellation task was used to provide a rough estimate of effort and persistence. Several pages containing simple and easily-discriminated designs (circles, squares, triangles, etc.) were presented to the child who was asked to draw a line through as many of the circles as he could in the allotted time of 3 minutes. A score for persistence of effort was obtained by computing the ratio of the number of figures cancelled during the third minute to the number cancelled during the first minute. Thus, the attempt was made to assess how hard the child would work at a task well within his capabilities which made minimal intellectual demands upon him. Directions for administration are presented in Appendix A.

(B). Persuasibility: To measure each child's responsiveness to the examiner, the "experimenter persuasibility" test was administered (Abelson and Lesser, 1959).* The attempt is made here to assess the child's general desire to seek the approval of the examiner in order to statistically control this variable in determining the impact of social class and cultural conditions upon mental abilities.

The examiner presents pictures of 19 pairs of unfamiliar objects (ships, hats, fish, buildings, etc.), asking the child to circle in red the pictured object he preferred in each pair. The examiner then indicated which object he, the tester, prefers by circling his choices in blue. The examiner disagreed with the subject's choices on a prearranged set of 12 of the 19 pairs, agreeing with the subject's choices on seven pairs distributed randomly throughout the booklet. Finally, the subject is reminded of the meanings of the red and blue circles and instructed "Mark the one you like now." The persuasibility score is the number of times out of a possible 12 that the subject changes his choice to agree with that of the examiner. Since two administrations of the persuasibility test were made (to allow the observation of any marked change in the child's responsiveness to the examiner which may have taken place between the first and third test sessions), the range of scores was from 0 to 24, indicating (respectively) no changes toward acceptance of the examiner's choices to full acceptance of all the examiner's expressed disagreements. The directions for administration appear in Appendix A.

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*The "experimenter persuasibility" measure and several alternative techniques for measuring persuasibility in young children are described in detail in Abelson, R.P. and Lesser, G.S. The measurement of persuasibility in children. In I.L. Janis and C.I. Hovland (Eds.) Personality and persuasibility. New Haven: Yale University Press, 1959. Pp. 141-166, 306-324.

(C) Interest:

A rough estimate of the child's interest in participating in the test procedure was obtained by the examiner at the end of the sessions by asking (see Appendix A): "We played a lot of games today. If I have time to come and see you again, would you like me to bring none of the games, a few of the games, or a lot of games?" The intention was to use this rough estimate (scored 1, 2, and 3 for the three choices, respectively) in the analysis of covariance. However, almost all children (perhaps from politeness) answered "a lot of games" and a negligible spread of scores was obtained. Therefore, this measure does not appear in the data analyses.

5. Selection and Training of Examiners:

Four psychometricians were selected and trained to administer the tests. Each of them represented one of the cultural groups being studied. When a second language was involved (see Table 6, p. 46) the tester was comfortable with the second language and could use it interchangeably with English during testing.

The reasons for this arrangement were noted in discussing the status of the numerous test variables in this research; while full confounding of examiner differences and subject differences is thus introduced, certain advantages are gained: (1) the arrangement permits the administration of instructions and test items in the child's primary language, in English, or in the most effective combination, and (2) in addition to hurdling any language barrier that might exist, rapport is more likely to be at an optimal level. Earlier studies (e.g., Anastasi, 1958a, pp. 561-570; Canady, 1936) have suggested that similarity of cultural background facilitates optimal performance during psychological examination.

Each of the four psychometricians had training to or beyond the Master's Degree level in psychology in addition to several years of experience in the administration and scoring of psychological tests including the WISC and Stanford-Binet. It may be of interest to future investigators to know that a Chinese psychologist was the most difficult of the four to locate and a Puerto Rican psychologist the next most difficult.

It proved necessary to recruit two additional Chinese testers in order to expand the number of dialects we could include. These testers were not psychologists, and special care was given to their training in psychological test administration. They were also carefully supervised throughout the study.

As was mentioned earlier, the cultural backgrounds of the examiners made them especially important participants in the revision of the tests. While making revisions, standard procedures of test administration were developed. When revisions were completed and rules of administration agreed upon, the examiners took turns administering the tests to one another in order to clarify individual interpretation of the rules.

During the pre-testing phase of the study, further refinements in rules of administration were agreed upon when the examiners met to pool their experiences with the test items and the children of their various cultural groups.

In the final phase of training, the examiners administered the test to one another again. A video tape recorder was then used to provide a detailed record of each examiner testing a child. The video tape allowed each tester to observe himself after the test session was completed and also permitted each examiner to carefully observe the testing of each of the other examiners. As a final check, each of the examiners administered the test to children of the appropriate age while the other examiners watched through a one-way vision screen and took notes on anything they considered a departure from standard procedure.

Results

This section describes the basic psychometric characteristics of the scales of mental ability and the evidence which tests the proposed hypotheses.

Table 12 presents the means and standard deviations for each scale and subtests for all subjects combined. Means and standard deviations for each ethnic group, social class, and sex sub-group are presented in the tables of reliabilities and intercorrelations (Tables 13-29).

Reliabilities (corrected for attenuation) and intercorrelations are presented for the entire group (Table 13), for each ethnic group (Tables 14-17), each social-class group (Tables 18-19), and each sex group (Tables 20-21). In addition, each ethnic group is divided into its middle and lower social-class components and the reliabilities and intercorrelations described (Tables 22-29).

A. Reliabilities:

The reliabilities based upon the entire sample (Table 13) are satisfactory, except that the reliability of the Space test (.85) is somewhat lower than desired.

Reliabilities do not vary greatly among ethnic groups (Tables 14-17). However, the Jewish children (.87) show a slightly lower reliability on the Verbal test than the other groups, and both Jewish (.84) and Negro children (.85) show somewhat lower reliabilities on the Reasoning scale. All ethnic groups show consistently high reliabilities for Number (.94-.96) and moderate reliabilities for Space (.80-.85).

The overall reliabilities for the two social-class groups are similar (Tables 18 and 19). However, the middle-class children show a slightly higher reliability on Verbal (.94 *vs.* .89) and slightly lower reliabilities on Reasoning (.85 *vs.* .91) and Space (.80 *vs.* .84) than lower-class children.

The overall reliabilities are similar for boys and girls (Tables 20 and 21), except on the Reasoning scale where the reliability coefficient for boys (.92) is somewhat higher than for girls (.84).

Looking at the reliabilities of each ethnic group when subdivided into its social-class components, the reliabilities again do not vary greatly (Tables 22-29). However, middle-class Jewish children show lower reliabilities than lower-class Jewish children on Verbal (.78 *vs.* .85) and Reasoning (.79 *vs.* .88). Middle-class Negro children show lower reliabilities than lower-class Negro children on Reasoning (.79 *vs.* .94) and Space (.63 *vs.* .81) and a somewhat higher reliability on Verbal (.90 *vs.* .84).

B. Intercorrelations:

Inspection of the intercorrelations based upon the entire sample (Table 13) indicates a rather disappointingly high set of interrelationships. In earlier research using similar tests with gifted children (Davis, Lesser, and French, 1960), substantially lower intercorrelations were obtained. These contrasting results are perhaps due to the much greater range of scores derived from children from extremely diverse social-class and ethnic backgrounds as compared with a highly unrepresentative group of gifted children.

The numerous tables of reliabilities and intercorrelations are offered here because they relate to the effect of the heterogeneity or homogeneity of samples upon the size of intercorrelations among the mental abilities. Somehwat different conclusions are reached concerning this question from tables based upon each ethnic, social-class, and sex group considered as a whole(Tables 14-21) and tables based upon ethnic groups subdivided into their middle and lower social-class components (Tables 22-29). The very heterogeneous samples obtained when each ethnic group (N = 80) contains both social-class components (Tables 14-17) or when each social-class group (N = 160) contains all ethnic groups (Tables 18-19) yield good reliabilities (median r of .91) but high intercorrelations (median r of .53). However, when the samples are reduced to more homogeneous groups by dividing each ethnic group into its separate social-class components (Tables 22-29), the reliabilities are reduced only negligibly (from .91 to .89) but the intercorrelations drop considerably (from .53 to .40). These data attest to the degree to which the current sampling of children from extremely diverse groups has affected the intercorrelations among the scales.

The strong intercorrelations in the present study are accompanied by high reliabilities for the scales. It is thus possible that considerable unique nonchance variance exists within each scale despite their degree of intercorrelation. Estimates of unique nonchance variables, as well as factor analyses, are proceeding.

The test of the proposed hypotheses is, of course, affected by these strong intercorrelations. The hypotheses predict differences among the social-class and ethnic groups in the patterns among the mental abilities. If such differences in patterns emerge when comparing social-class groups or ethnic groups despite the limited different differentiation among abilities, such findings may then testify even more convincingly to the power of the social-class and cultural influences than if greater differentiation of abilities existed.

The following additional specific observations are offered concerning the intercorrelations reported in Tables 13-29. Table 13 suggests that for all subjects combined, Reasoning (median r of .62) correlates most strongly with the other scales while Verbal (median r of .54) and Space (median r of .54) correlate least strongly with the other scales. Since verbal ability is considered to be the most important confounding factor in testing mental abilities, these data suggest some degree of success in reducing the contributions of verbal differences to scores on other scales (at least relative to the contributions of the other scales to each other). The somewhat lower intercorrelations of the Space scale (median r of .54) are perhaps attributable to its lower reliability.

Tables 14-17 suggest that differentiation among the various mental abilities is greatest for Chinese children (median r of .46) and least for the Negro children (median r of .61), despite nearly equivalent reliabilities.

Tables 18-19 suggest that the Verbal scores of middle-class children are somewhat less differentiated from the other abilities (median r of .50) than the Verbal scores of lower-class children (median r of .40). However, this difference may be attributable to the difference in reliability of the Verbal scores (.94 and .89 for middle-class and lower-class children, respectively). The other mental ability areas show very similar degrees of differentiation when middle-class and lower-class groups are compared.

Tables 20-21 suggest that boys show a small but consistently greater differentiation among abilities (median r of .51) than girls (median r of .60). This difference occurs despite the fact that in the one instance of differing reliability (Reasoning), the boys show a higher reliability (.92 _vs._ .84).

Tables 22-29 suggest that: (1) middle-class Chinese children (median r of .45) show _less_ differentiation among all abilities than lower-class Chinese children (median r of .40); however, this difference lies primarily in the Verbal area where the middle-class Chinese (median r of .38) show _less_ differentiation of Verbal scores than lower-class Chinese (median r of .24), (2) middle-class Jewish children median r of .27) show _more_ differentiation among all abilities than lower-class Jewish children (median r of .43), (3) middle-class Negro children (median r of .31) show more differentiation among all abilities than lower-class Negro children (median r of .40), (4) middle-class Puerto Rican children (median r of .57) show less differentiation among all abilities than lower-class Puerto Rican children (median r of .40). Some of these differences may perhaps be assigned to differential reliabilities, but no consistent correspondence between reliabilities and intercorrelations emerges.

Table 12

Means and Standard Deviations of All Scales and Subtests for All Ethnic, Social Class, and Sex Groups Combined

SCALE AND SUBTEST	MEAN	STANDARD DEVIATION	MAXIMUM SCORE
Picture Vocabulary	43.4031	8.7965	60
Word Vocabulary	31.0094	11.0072	60
Sum of Verbal	74.4125	18.3364	120
Picture Analogies	9.8375	3.3992	18
Picture Arrangement	7.0969	4.4937	16
Jump Peg	5.6812	3.3098	12
Sum of Reasoning	22.6156	8.5863	46
Enumeration	4.9719	1.1999	6
Addition	6.1062	2.9772	10
Subtraction	6.0406	3.0905	10
Multiplication	3.4844	3.3194	10
Division	3.8469	2.8872	10
Sum of Numerical	23.4500	10.8644	46
Object Completion	16.9562	6.7780	32
Estimating Path	8.0625	1.9144	12
Jig Saw	7.6781	3.6124	16
Perspective	5.2375	2.2402	10
Sum of Spatial	37.9344	10.7103	70
Effort	117.8469	29.0262	
Persuasibility	12.2500	7.3625	24
Age	81.5125	3.5681	

Table 13

Intercorrelations and Reliability Coefficients* of Scales of Mental Ability Based Upon the Total Sample of 320 Children From All Ethnic, Social Class, and Sex Groups Combined

	Verbal	Reasoning	Number	Space
Verbal	.93	.58	.54	.44
Reasoning		.92	.73	.62
Number			.96	.54
Space				.85
Mean	74.41	22.61	23.45	37.93
SD	18.34	8.59	10.86	10.71

*Reliability coefficients are in diagonal cells. These are split-half, odd-even coefficients corrected for attenuation. Since all subtests were unspeeded, the reliability coefficients do not include the spurious contribution of speed.

Table 14

Intercorrelations and Reliability Coefficients of Scales for 80 Chinese Children

	Verbal	Reasoning	Number	Space
Verbal	.91	.42	.38	.34
Reasoning		.90	.64	.64
Number			.94	.49
Space				.83
Mean	71.09	25.94	27.79	42.51
SD	14.57	7.12	9.35	10.09

Table 15

Intercorrelations and Reliability Coefficients of Scales for 80 Jewish Children

	Verbal	Reasoning	Number	Space
Verbal	.87	.70	.54	.48
Reasoning		.84	.68	.49
Number			.95	.40
Space				.80
Mean	90.35	25.21	28.50	39.71
SD	11.70	6.67	9.88	9.21

Table 16

Intercorrelations and Reliability Coefficients of Scales for 80 Negro Children

	Verbal	Reasoning	Number	Space
Verbal	.93	.62	.58	.59
Reasoning		.85	.71	.68
Number			.96	.54
Space				.85
Mean	74.29	20.41	18.39	34.42
SD	16.48	9.43	10.20	11.56

Table 17

Intercorrelations and Reliability Coefficients of Scales for 80 Puerto Rican Children

	Verbal	Reasoning	Number	Space
Verbal	.90	.62	.58	.48
Reasoning		.93	.74	.49
Number			.96	.49
Space				.84
Mean	61.92	18.90	19.13	35.09
SD	17.41	8.62	9.71	9.70

Table 18

Intercorrelations and Reliability Coefficients of Scales for 160 *Middle-Class* Children

	Verbal	Reasoning	Number	Space
Verbal	.94	.52	.50	.38
Reasoning		.85	.63	.52
Number			.95	.41
Space				.80
Mean	82.21	26.08	27.67	42.12
SD	16.55	7.33	9.89	9.33

Table 19

Intercorrelations and Reliability Coefficients of Scales for 160 *Lower-Class* Children

	Verbal	Reasoning	Number	Space
Verbal	.89	.47	.40	.28
Reasoning		.91	.73	.57
Number			.96	.51
Space				.84
Mean	66.62	19.15	19.22	33.75
SD	16.64	8.35	10.12	10.36

Table 20

Intercorrelations and Reliability Coefficients of Scales for 160 Boys

	Verbal	Reasoning	Number	Space
Verbal	.92	.51	.51	.40
Reasoning		.92	.71	.62
Number			.95	.51
Space				.83
Mean	75.50	23.01	23.15	39.01
SD	17.59	8.72	10.68	10.39

Table 21

Intercorrelations and Reliability Coefficients of Scales for 160 Girls

	Verbal	Reasoning	Number	Space
Verbal	.93	.64	.57	.47
Reasoning		.84	.75	.62
Number			.97	.58
Space				.86
Mean	73.32	22.21	23.75	36.90
SD	19.0	8.43	11.04	10.92

Table 22

Intercorrelations and Reliability Coefficients of Scales for 40 Middle-Class Chinese Children

	Verbal	Reasoning	Number	Space
Verbal	.92	.49	.38	.30
Reasoning		.91	.63	.64
Number			.94	.40
Space				.83
Mean	76.85	27.67	29.97	44.92
SD	14.22	6.59	8.84	9.78

Table 23

Intercorrelations and Reliability Coefficients of Scales for 40 Lower-Class Chinese Children

	Verbal	Reasoning	Number	Space
Verbal	.86	.23	.27	.24
Reasoning		.90	.61	.59
Number			.94	.52
Space				.82
Mean	65.32	24.20	25.60	40.10
SD	12.48	7.20	9.33	9.81

Table 24

Intercorrelations and Reliability Coefficients
of Scales for 40 *Middle-Class Jewish* Children

	Verbal	Reasoning	Number	Space
Verbal	.78	.36	.32	.21
Reasoning		.79	.47	.16
Number			.95	.12
Space				.74
Mean	96.72	28.77	33.50	44.35
SD	7.86	4.69	8.13	8.75

Table 25

Intercorrelations and Reliability Coefficients
of Scales for 40 *Lower-Class Jewish* Children

	Verbal	Reasoning	Number	Space
Verbal	.85	.68	.40	.36
Reasoning		.88	.63	.45
Number			.94	.28
Space				.74
Mean	83.97	21.65	23.50	35.07
SD	11.44	6.45	8.90	7.07

Table 26

Intercorrelations and Reliability Coefficients of Scales for 40 *Middle-Class Negro* Children

	Verbal	Reasoning	Number	Space
Verbal	.90	.23	.36	.25
Reasoning		.79	.45	.48
Number			.94	.19
Space				.63
Mean	85.67	26.05	24.67	41.77
SD	11.37	7.02	8.63	7.44

Table 27

Intercorrelations and Reliability Coefficients of Scales for 40 *Lower-Class Negro* Children

	Verbal	Reasoning	Number	Space
Verbal	.84	.47	.17	.28
Reasoning		.94	.63	.48
Number			.94	.32
Space				.81
Mean	62.90	14.77	12.10	27.07
SD	12.43	8.07	7.40	10.19

Table 28

Intercorrelations and Reliability Coefficients of Scales for 40 Middle-Class Puerto Rican Children

	Verbal	Reasoning	Number	Space
Verbal	.92	.63	.58	.51
Reasoning		.92	.70	.50
Number			.94	.55
Space				.85
Mean	69.57	21.82	22.55	37.42
SD	17.07	8.51	9.91	9.26

Table 29

Intercorrelations and Reliability Coefficients of Scales for 40 Lower-Class Puerto Rican Children

	Verbal	Reasoning	Number	Space
Verbal	.84	.48	.40	.36
Reasoning		.93	.72	.39
Number			.96	.34
Space				.81
Mean	54.27	15.97	15.70	32.75
SD	14.07	7.69	8.19	9.56

C. Analyses of Variance:

Tests of the proposed hypotheses are contained in this and the remaining sections of Results. These hypotheses are described earlier (p. 19) and consider the effects of social-class and ethnic-group influences upon both the *level* of each mental ability considered singly and the *pattern* among mental ability scores considered in combination. The hypotheses concerning *level* are considered here; hypotheses concerning *pattern* are tested in Section E (Pattern Analyses).

Predictions concerning *level* of performance on each mental ability are:

1. Significant differences will exist between the two *social-class* groups in the *level* of scores for each mental ability.

2. Significant differences will exist among the four *ethnic* groups in the *level* of scores for each mental ability.

3. *Social-class* and *ethnicity* will interact significantly in determining the *level* of scores for each mental ability.

To test these hypotheses, a 4 x 2 x 2 analysis of variance design (completely balanced randomized blocks) was used. Four ethnic groups (Chinese, Jewish, Negro, and Puerto Rican) were included, each divided into two social-class groups (middle and lower), each in turn divided into equal numbers of boys and girls. Thus, a total of 16 subgroups, each composed of 20 children, is represented.

Table 30 summarizes the significant effects emerging from the analyses of variance based upon each mental ability area considered singly. These findings provide strong support for Hypotheses 1-3. Both ethnicity (Hypothesis 1) and social-class (Hypothesis 2) affect strongly the level of each mental ability (all p-values beyond the .001 level of confidence) and all social class x ethnicity interactions for total scale scores are statistically significant (p-values beyond the .05 level).

Table 31 presents the mean Verbal scores for each ethnic, social class, and sex group; tables of effects are also included. Table 32 presents the analysis of variance results based upon total scores of Verbal ability.

Tables 33 and 34 present the mean scores and analysis of variance of the Reasoning scale, Tables 35 and 36 present the mean scores and analysis of variance of the Numerical scale, and Tables 37 and 38 describe the mean scores and analysis of variance of the Spatial Conceptualization scale.

Analysis of variance results for each subtest (e.g., Picture Vocabulary, Word Vocabulary, Picture Analogies, etc.) appear in Appendix C. F-ratios below 1.00 are not listed in any analysis of variance table.

Table 39 presents t-tests of differences between ethnic groups for all four mental ability scales.

Table 30

Summary of Analyses of Variance Results
When Each Mental Ability is Considered Singly

Mental Ability Scale

Source of Variance	Verbal			Reasoning				Number						Space				
	Pict. Voc.	Word Voc.	Tot.	Pict. Anal	Pict. Arr.	Jump Peg	Tot.	Enum	Add.	Sub.	Mult.	Div.	Tot.	Obj. Comp.	Est. Path.	Jig Saw	Pers.	Tot.
Social Class	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.01	.001	.001	.001
Ethnicity	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001	.05	.001	.001	.001	.001
Sex	.01	-	-	-	-	.01	-	-	-	-	-	-	-	-	-	.05	.05	.05
Class x Ethnicity	-	.05	.05	-	.001	-	.01	.05	.01	.05	-	-	.05	.01	-	.05	-	.01
Class x Sex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sex x Ethnicity	.01	.05	.05	-	-	-	-	-	-	-	-	-	-	.01	-	-	-	.05
Class x Sex x Ethnicity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.05	-	-

Table 31

Verbal Ability Scores For Each Ethnic, Social Class, and Sex Group

Tables of Means

Chinese

Social-Class

Sex	Lo	Hi	
B	66.5	77.1	71.8
G	64.2	76.6	70.4
	65.3	76.8	71.1

Jewish

	Lo	Hi	
B	80.1	95.9	88.0
G	87.9	97.6	92.7
	84.0	96.7	90.4

Negro

	Lo	Hi	
B	63.0	86.8	74.9
G	62.9	84.6	73.7
	62.9	85.7	74.3

P.R.

	Lo	Hi	
B	57.4	77.3	67.3
G	51.2	61.9	56.6
	54.3	69.6	61.9

Total

	Lo	Hi	
B	66.7	84.2	75.5
G	66.5	80.2	73.3
	66.6	82.2	74.4

Tables of Effects

Chinese

Social-Class

Sex	Lo	Hi	
B	+1.43	-1.43	-0.36
G	-1.43	+1.43	+0.36
	+2.03	-2.03	-3.33

Jewish

	Lo	Hi	
B	-0.53	+0.53	-3.45
G	+0.53	-0.53	+3.45
	+1.42	-1.42	+15.94

Negro

	Lo	Hi	
B	+0.43	-0.43	-0.49
G	-0.43	+0.43	+0.49
	-3.59	+3.59	-0.13

P.R.

	Lo	Hi	
B	-1.33	+1.33	+4.30
G	+1.33	-1.33	-4.30
	+0.14	-0.14	-12.49

Total

	Lo	Hi	
B	-0.97	+0.97	+1.08
G	+0.97	-0.97	-1.08
	-7.79	+7.79	74.41

Table 32

Analysis of Variance of Total Scores of Verbal Ability

Source	SS	dF	MS	F	p
Class	19,437.612	1	19,437.6	119.5	<.001
Ethnicity	33,681.025	3	11,227.0	69.0	<.001
Sex	369.800	1	369.800	2.3	-
Class & Ethnicity	1,525.963	3	508.6	3.1	<.05
Class & Sex	300.313	1	300.3	1.8	-
Sex & Ethnicity	2,460.925	3	820.3	5.0	<.01
Class & Sex & Ethnicity	343.13	3	114.4		-
Individual	49,472.800	304	162.74		
Total	107,591.55	319	337.28		

Table 33

Reasoning Scores for Each Ethnic, Social Class, and Sex Group

Tables of Means

Chinese

Social-Class

Sex	Lo	Hi	
B	27.0	28.1	27.5
G	21.4	27.3	24.4
	24.2	27.7	25.9

Jewish

	Lo	Hi	
B	20.3	27.7	24.0
G	23.1	29.9	26.4
	21.6	28.8	25.2

Negro

	Lo	Hi	
B	15.0	26.5	20.7
G	14.6	25.6	20.1
	14.8	26.0	20.4

P.R.

	Lo	Hi	
B	16.3	23.2	19.7
G	15.7	20.5	18.1
	16.0	21.8	18.9

Total

	Lo	Hi	
B	19.6	26.4	23.0
G	18.6	25.8	22.2
	19.1	26.1	22.6

Tables of Effects

Chinese

Social-Class

Sex	Lo	Hi	
B	+1.11	-1.11	+1.21
G	-1.11	+1.11	-1.21
	+1.73	-1.73	+3.32

Jewish

	Lo	Hi	
B	-0.27	+0.27	-1.61
G	+0.27	-0.27	+1.61
	-0.10	+0.10	+2.60

Negro

	Lo	Hi	
B	0.24	+0.24	-0.06
G	+0.24	-0.24	+0.06
	-2.17	+2.17	-2.20

P.R.

	Lo	Hi	
B	-0.60	+0.60	+0.45
G	+0.60	-0.60	-0.45
	+1.54	-1.54	-3.72

Total

	Lo	Hi	
B	+0.10	-0.10	+0.37
G	-0.10	+0.10	-0.37
	-3.47	+3.47	22.62

Table 34

Analysis of Variance of Total

Scores of Reasoning Ability

Source	SS	dF	MS	F	p
Class	3,843.378	1	3,843.48	74.59	<.001
Ethnicity	2,915.059	3	971.70	18.86	<.001
Sex	44.253	1	44.25		-
Class & Ethnicity	640.409	3	213.94	4.15	<.01
Class & Sex	3.403	1	3.40		-
Sex & Ethnicity	342.134	3	114.05	2.21	-
Class & Sex & Ethnicity	137.835	3	45.94		-
Individual	15,665.250	304	51.53		
Total	23,591.721	319	73.955		

Table 35

Numerical Scores for Each Ethnic, Social Class, and Sex Group

Tables of Means

Chinese

Sex	Social-Class Lo	Social-Class Hi	
B	25.2	30.6	27.9
G	27.3	29.3	28.3
	26.2	30.0	28.1

Jewish

	Lo	Hi	
B	23.8	31.0	27.4
G	23.2	35.8	29.5
	23.5	33.4	28.5

Negro

	Lo	Hi	
B	12.5	24.0	18.2
G	11.7	25.4	18.5
	12.1	24.7	18.4

P.R.

	Lo	Hi	
B	14.8	23.2	19.0
G	16.6	21.9	19.2
	15.7	22.6	19.1

Total

	Lo	Hi	
B	19.1	27.2	23.1
G	19.7	28.1	23.9
	19.4	27.7	23.5

Tables of Effects

Chinese

Sex	Social-Class Lo	Social-Class Hi	
B	-0.68	+0.68	+0.43
G	+0.68	-0.68	-0.43
	+2.04	-2.04	+4.34

Jewish

	Lo	Hi	
B	+1.19	-1.19	-0.74
G	-1.19	+1.19	+0.74
	-0.78	+0.78	+5.05

Negro

	Lo	Hi	
B	+0.40	-0.40	+0.15
G	-0.40	+0.40	-0.15
	-2.06	+2.06	-5.06

P.R.

	Lo	Hi	
B	-0.91	+0.91	+0.16
G	+0.91	-0.91	-0.16
	+0.80	-0.80	-4.32

Total

	Lo	Hi	
B	+0.14	-0.14	-0.29
G	-0.14	+0.14	+0.29
	-4.23	+4.23	23.45

Table 36

Analysis of Variance of Total Scores of Numerical Ability

Source	SS	dF	MS	F	p
Class	5,712.200	1	5,712.200	74.96	<.001
Ethnicity	7,092.075	3	2,364.025	31.02	<.001
Sex	26.450	1	26.450		-
Class & Ethnicity	771.675	3	257.225	3.28	<.05
Class & Sex	6.050	1	6.050		-
Sex & Ethnicity	61.875	3	20.625		-
Class & Sex & Ethnicity	228.675	3	76.208		-
Individual	23,872.200	304	78.526		
Total	37,771.200	319	118.405		

Table 37

Spátial Conceptualization Scores for Each Ethnic, Social Class, and Sex Group

Tables of Means

Chinese

Social-Class

Sex	Lo	Hi	
B	43.2	47.0	45.1
G	37.7	42.8	40.2
	40.4	44.9	42.7

Jewish

	Lo	Hi	
B	34.4	42.0	38.2
G	35.7	47.2	41.4
	35.1	44.6	39.8

Negro

	Lo	Hi	
B	26.8	44.8	35.8
G	27.4	38.7	33.0
	27.1	41.8	34.4

P.R.

	Lo	Hi	
B	34.9	40.0	37.4
G	30.6	34.8	32.7
	32.8	37.4	35.1

Total

	Lo	Hi	
B	34.8	43.5	39.2
G	32.8	40.9	36.9
	33.8	42.2	38.0

Tables of Effects

Chinese

Social-Class

Sex	Lo	Hi	
B	+0.31	-0.31	+1.19
G	-0.31	+0.31	-1.19
	+1.77	-1.77	+4.58

Jewish

	Lo	Hi	
B	+1.26	-1.26	-2.78
G	-1.26	+1.26	+2.78
	-0.45	+0.45	+1.78

Negro

	Lo	Hi	
B	-1.53	+1.53	+0.30
G	+1.53	-1.53	-0.30
	-3.17	+3.17	-3.51

P.R.

	Lo	Hi	
B	-0.04	+0.04	+1.29
G	+0.04	-0.04	-1.29
	+1.85	-1.85	-2.85

Total

	Lo	Hi	
B	-0.17	+0.17	+1.07
G	+0.17	-0.17	-1.07
	-4.18	+4.18	37.93

Table 38

Analysis of Variance of Total Scores of Spatial Conceptualization

Source	SS	df	MS	F	p
Class	5,602.878	1	5,602.88	69.16	<.001
Ethnicity	3,563.309	3	1,187.77	14.66	<.001
Sex	367.653	1	367.65	4.54	<.05
Class & Ethnicity	1,342.160	3	447.39	5.52	<.01
Class & Sex	9.453	1	9.45		-
Sex & Ethnicity	874.235	3	291.41	3.60	<.05
Class & Sex & Ethnicity	321.484	3	107.16	1.32	-
Individual	24,626.450	304	81.01		
Total	36,707.622	319	115.07		

Table 39

Differences Between Ethnic Groups On The Four Scales of Mental Ability (Based Upon t - Tests)

		Jewish	Negro	Puerto Rican
Chinese	Verbal	4.60***	0.76	2.19*
	Reasoning	0.33	2.49*	3.18**
	Numerical	0.26	3.48***	3.21**
	Space	1.00	2.88**	2.65**
Jewish	Verbal		3.84***	6.79***
	Reasoning		2.17*	2.85**
	Numerical		3.75***	3.47***
	Space		1.89	1.65
Negro	Verbal			2.95**
	Reasoning			0.68
	Numerical			0.27
	Space			0.24

*, **, *** $p < .05, .01, .001$, respectively (two-tailed test)

Tables 30-39 (presenting means, analyses of variance, and t-tests) permit the following conclusions regarding the effect of the independent variable upon the level of each mental ability. Table 40 is extracted from Tables 30-39 and merely reorganizes the means so that these conclusions are clarified:

1. Regarding social-class effects upon mental abilities, middle-class children are significantly superior to lower-class children on all scales and subtests.

2. Regarding ethnic-group effects upon mental abilities:

   a. On Verbal ability, Jewish children rank first (being significantly better than all other ethnic groups), Negroes second and Chinese third (both being significantly better than Puerto Ricans), and Puerto Ricans fourth.

   b. On Reasoning, the Chinese rank first and Jews second (both being significantly better than Negroes and Puerto Ricans), Negroes third, Puerto Ricans fourth.

   c. On Numerical ability, Jews rank first and Chinese second (both being significantly better than Puerto Ricans and Negroes), Puerto Ricans third, Negroes fourth.

   d. On Space, Chinese rank first (being significantly better than Puerto Ricans and Negroes), Jews second, Puerto Ricans third, and Negroes fourth.

3. Regarding sex differences, boys are significantly better than girls on the Picture Vocabulary subtest (but not on the total Verbal scale), the Jump Peg subtest (but not on the total Reasoning scale), and on the total Space scale.

4. Regarding the interactions of social class and ethnicity, two effects combine to produce the statistically significant effects upon each scale of mental ability:

a. On each mental ability scale, social class position produces more of a difference in the mental abilities of the Negro children than for the other groups. That is, the middle-class Negro children are more different in level of mental abilities from the lower-class Negroes than, for example, the middle-class Chinese are from the lower-class Chinese.

b. On each mental ability scale, the scores of the middle-class children from the various ethnic groups resemble each other to a greater extent than do the scores of the lower-class children from the various ethnic groups. That is, the middle-class Chinese, Jewish, Negro, and Puerto Rican children are more alike in their mental ability scores than are the lower-class Chinese, Jewish, Negro, and Puerto Rican children.

5. Regarding the interactions of sex and ethnicity, the significant interactions for both Verbal and Space reflect the higher scores for boys than for girls in all ethnic groups, except for the Jewish children; Jewish girls are superior to Jewish boys for both Verbal and Space scales.

6. Since a significant second-order interaction (class x sex x ethnicity) emerged on only one (Jig Saws) of fourteen subtests, no interpretive significance will be assigned.

7. The complete absence of significant social class x sex interactions (within the matrix of highly significant effects reported in Table 30) should also be noted.

Table 40

Mean Scores For Social Class And Ethnic Groups On Each Mental Ability Scale

Ethnic Groups

Verbal		Ch.	Jew.	N.	P.R.	
Social-Class	Hi	76.8	96.7	85.7	69.6	82.2
	Lo	65.3	84.0	62.9	54.3	66.6
		71.1	90.4	74.3	61.9	74.4

Reasoning		Ch.	Jew.	N.	P.R.	
	Hi	27.7	28.8	26.0	21.8	26.1
	Lo	24.2	21.6	14.8	16.0	19.1
		25.9	25.2	20.4	18.9	22.6

Number		Ch.	Jew.	N.	P.R.	
	Hi	30.0	33.4	24.7	22.5	27.7
	Lo	26.2	23.5	12.1	15.7	19.4
		28.1	28.5	18.4	19.1	23.5

Space		Ch.	Jew.	N.	P.R.	
	Hi	44.9	44.6	41.8	37.4	42.2
	Lo	40.4	35.1	27.1	32.8	33.8
		42.7	39.8	34.4	35.1	38.0

D. Analyses of Variance with Co-Variance Control:

The results of the analyses of variance with co-variance control (where the measures of effort, responsiveness to the tester, and age are statistically controlled) will not be described in detail since they differ only negligibly from the analyses of variance. The only change produced when co-variance control is used is to increase the p-value of the sex x ethnicity interaction on Verbal scale scores from .05 to .01.

Although the co-variance results do not warrant detailed description, analyses of variance conducted on the effort and persuasibility measures are described in Appendix D (Tables D1 and D2). Ethnic-group effects are prominent. On the measure of effort (Table D1), the Negroes work hardest (mean of 127.9), Chinese (118.6) and Puerto Ricans (115.6) are next, and Jewish children last (109.2). On the measure of persuasibility, the Puerto Rican (mean of 14.3) and Negroes (13.6) are most responsive to the tester, and the Jews (11.0) and Chinese (10.1) least responsive. Thus, Negroes are consistent in working persistently on a simple task and being responsive to the tester, Jewish children show least effort and low persuasibility.

E. Pattern Analyses:

The previous sections describe the results bearing upon level of performance for each mental ability considered singly (Hypotheses 1-3, p.104). The following predictions bear upon the pattern among mental ability scores considered in combination:

4. Significant differences will exist between the two social-class groups in the pattern of scores from the four mental ability scales.

5. Significant differences will exist among the four ethnic groups in the pattern of scores from the four mental ability scales.

6. Social-class and ethnicity will interact significantly in determining the pattern of scores from the four mental ability scales.

An analysis of variance test for the existence of group psychometric patterns and configurations of test scores was used. This method* depends upon the fact that profile differences from group to group reflect themselves in the interaction term of groups x test variables. The error term is the individuals x test variables interaction obtained separately for each group, then summed over groups; this error term appears as the "residual" in the tables which follow. This technique yields an estimate of the difference in profiles which is independent of the different levels at which the several profiles may fall. For purposes of this analysis, total scale scores are normalized standard scores (normalized across the total sample of 320 children).

Figure 1 and Tables 41 and 42 provide the test of Hypothesis 4 which predicts social-class differences in the pattern of scale scores. The F-ratio of 0.20 (Table 42)provides no support for this prediction; indeed, the patterns for the two social-class groups are remarkably similar.

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*Described in detail in Block, J., Levine, L., and McNemar, Q. Testing for the significance of psychometric patterns. J. abnorm. soc. Psychol., 1951, 46, 356-359.

Figure 2 and Tables 43 and 44 provide the test of Hypothesis 5 which predicts ethnic-group differences in the pattern of scale scores. The F-ratio of 17.32 ($p < .001$) provides strong support for this prediction.

Figures 3-6 and Tables 45-49 contain the test of Hypothesis 6 which predicts that social-class and ethnicity will interact significantly in determining the pattern of scale scores. These data indicate that, for each ethnic group, the scale scores for middle-class and lower-class children are almost exactly parallel. For Chinese children (Table 46), the F-ratio for pattern difference between middle- and lower-class is 0.24, for Jews, 0.30, for Negroes, 0.15, and for Puerto Ricans, 1.35. Thus, only the Puerto Rican children depart at all from almost exact parallels for middle- and lower-class profiles, and this departure is of course non-significant. No confirmation exists in these observations for the hypothesis of a significant interaction between social-class and ethnicity in affecting patterns of mental ability scores.

Although pattern differences for boys and girls (by social class and ethnic group) are not directly pertinent to the test of the hypotheses, these data appear in Appendix E.

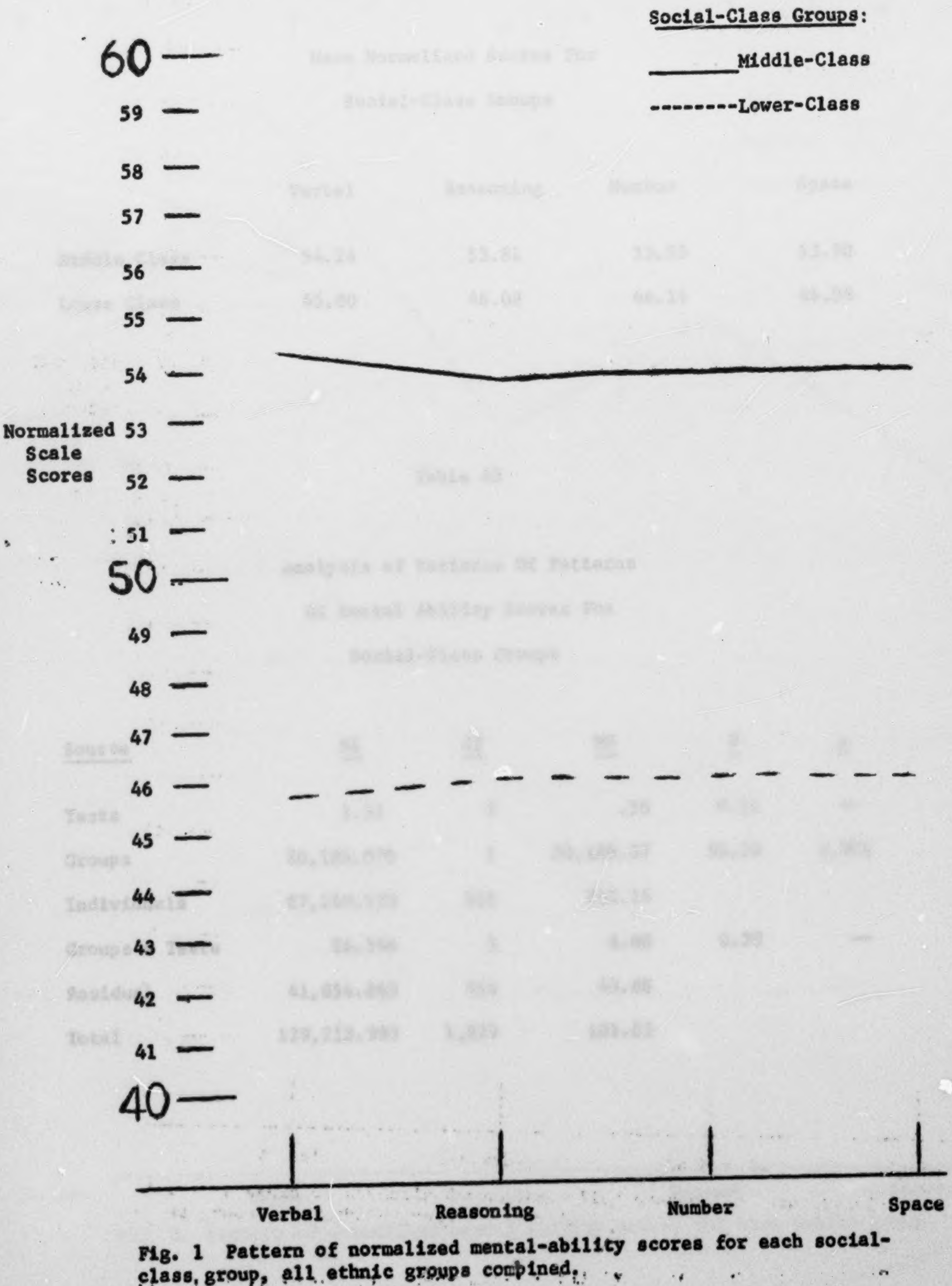

Fig. 1 Pattern of normalized mental-ability scores for each social-class group, all ethnic groups combined.

Table 41

Mean Normalized Scores For Social-Class Groups

	Verbal	Reasoning	Number	Space
Middle Class	54.24	53.81	53.93	53.90
Lower Class	45.80	46.08	46.14	46.09

Table 42

Analysis of Variance Of Patterns Of Mental Ability Scores For Social-Class Groups

Source	SS	dF	MS	F	P
Tests	1.51	3	.50	0.11	—
Groups	20,185.070	1	20,185.07	95.59	$<.001$
Individuals	67,149.173	318	211.16		
Groups x Tests	26.394	3	8.80	0.20	—
Residual	41,856.843	954	43.88		
Total	129,218.993	1,279	101.03		

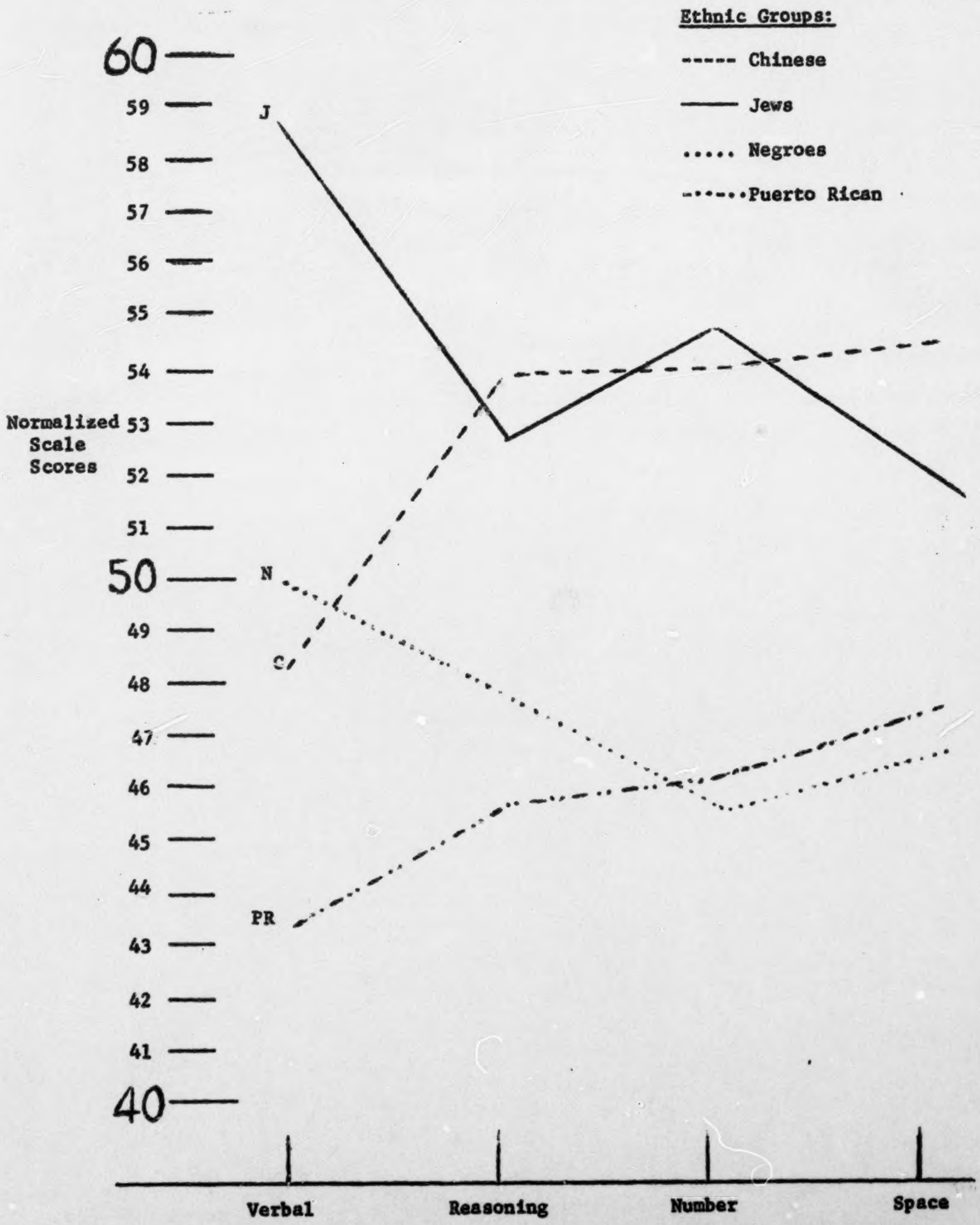

Fig. 2 Pattern of normalized mental ability scores for each ethnic group.

Table 43

Mean Normalized Scores For
Ethnic Groups

	Verbal	Reasoning	Number	Space
Chinese	48.19	53.88	53.93	54.36
Jewish	58.68	52.61	54.71	51.78
Negro	49.89	47.69	45.43	46.48
Puerto Rican	43.33	45.60	46.08	47.36

Table 44

Analysis Of Variance Of Patterns Of
Mental Ability Scores For
Ethnic Groups

Source	SS	dF	MS	F	P
Tests	1.509	3	.50	0.13	—
Groups	16,898.596	3	5,632.87	25.27	<.001
Individuals	70,435.647	316	222.90		
Groups x Tests	5,913.575	9	657.06	17.32	<.001
Residual	35,969.666	948	37.94		
Total	129,218.993	1,279	101.03		

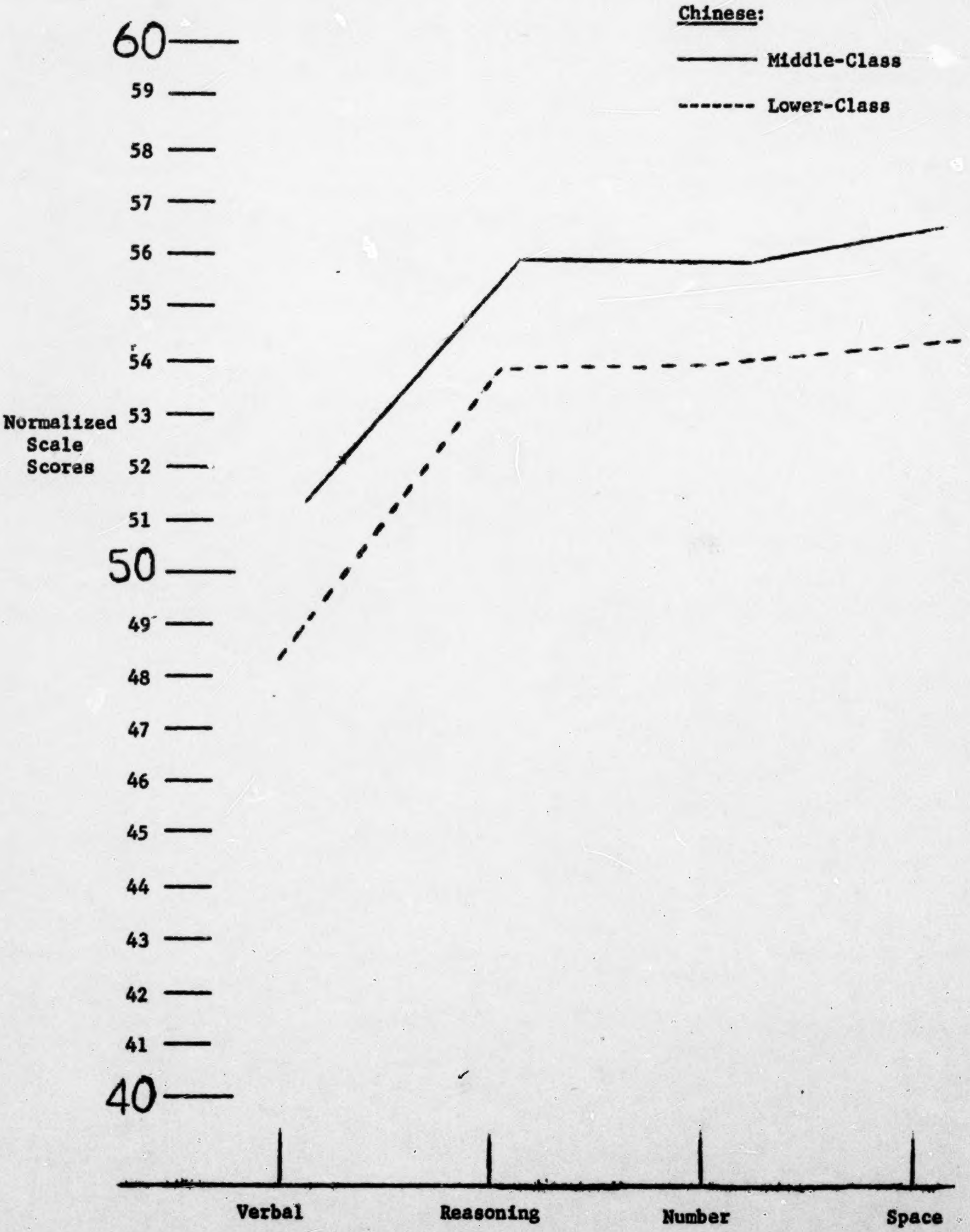

Fig. 3 Patterns of normalized mental-ability scores for middle-class and lower-class Chinese children.

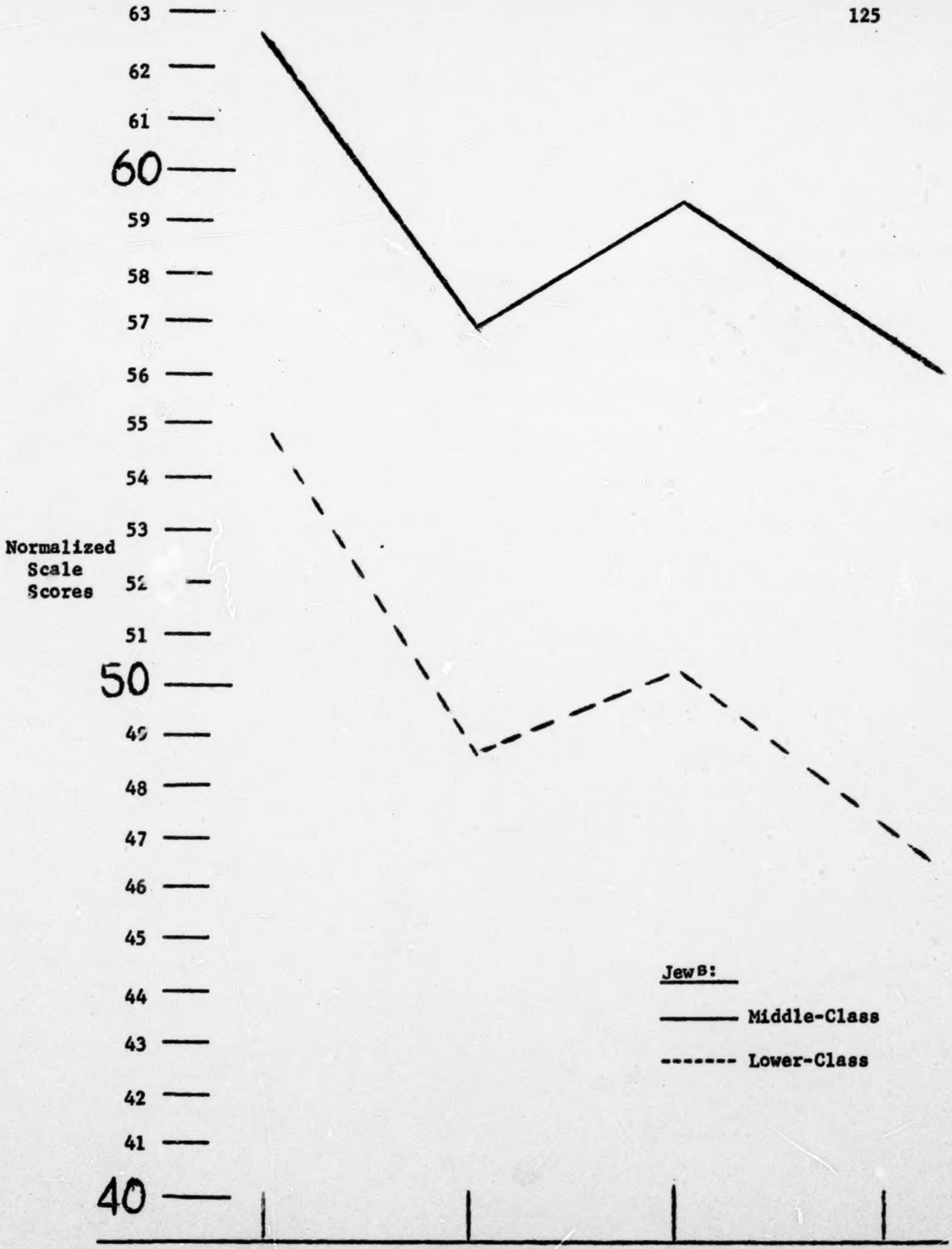

Fig. 4 Patterns of normalized mental-ability scores for middle-class and lower-class Jewish children.

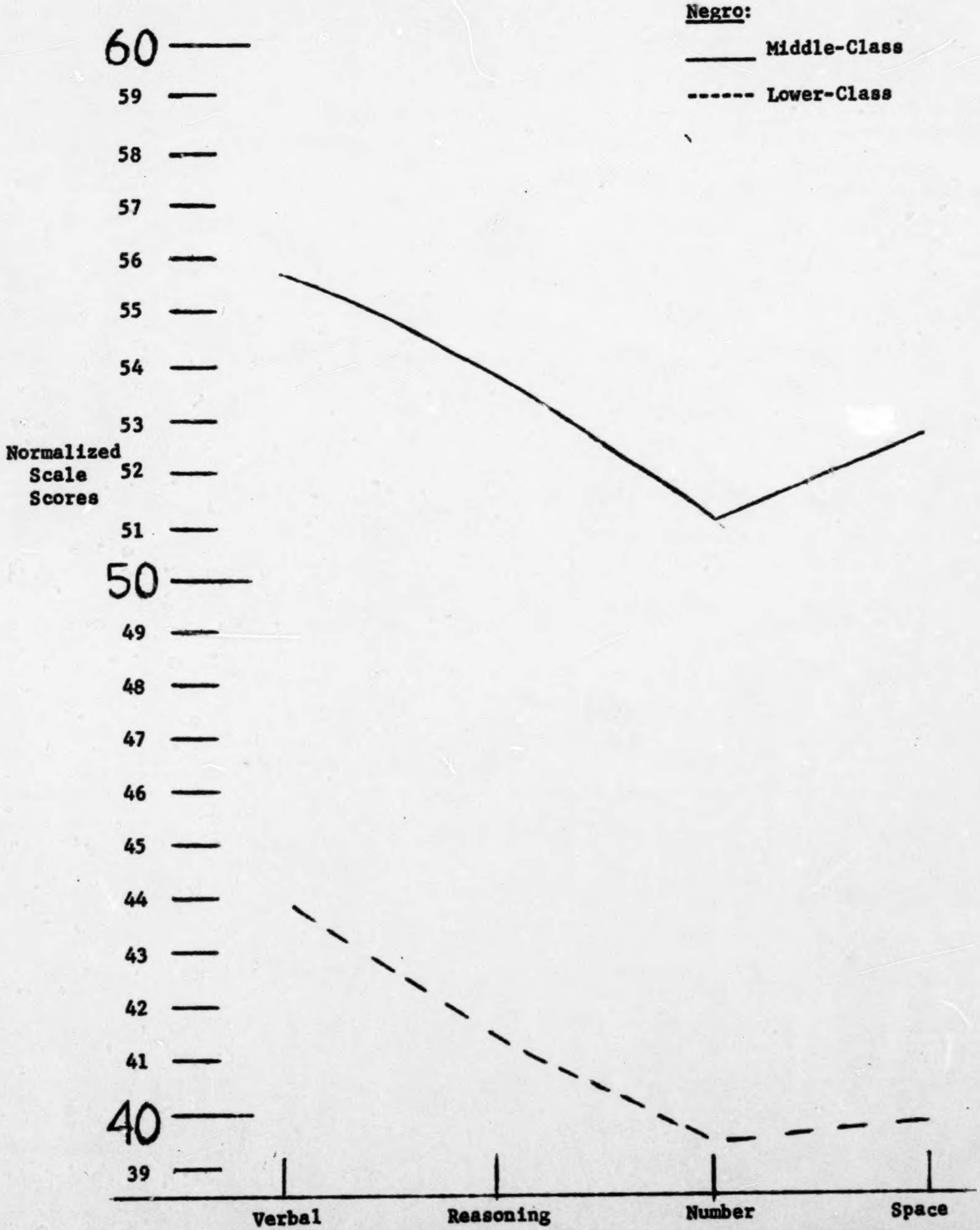

Fig. 5 Patterns of normalized mental-ability scores for middle-class and lower-class Negro children.

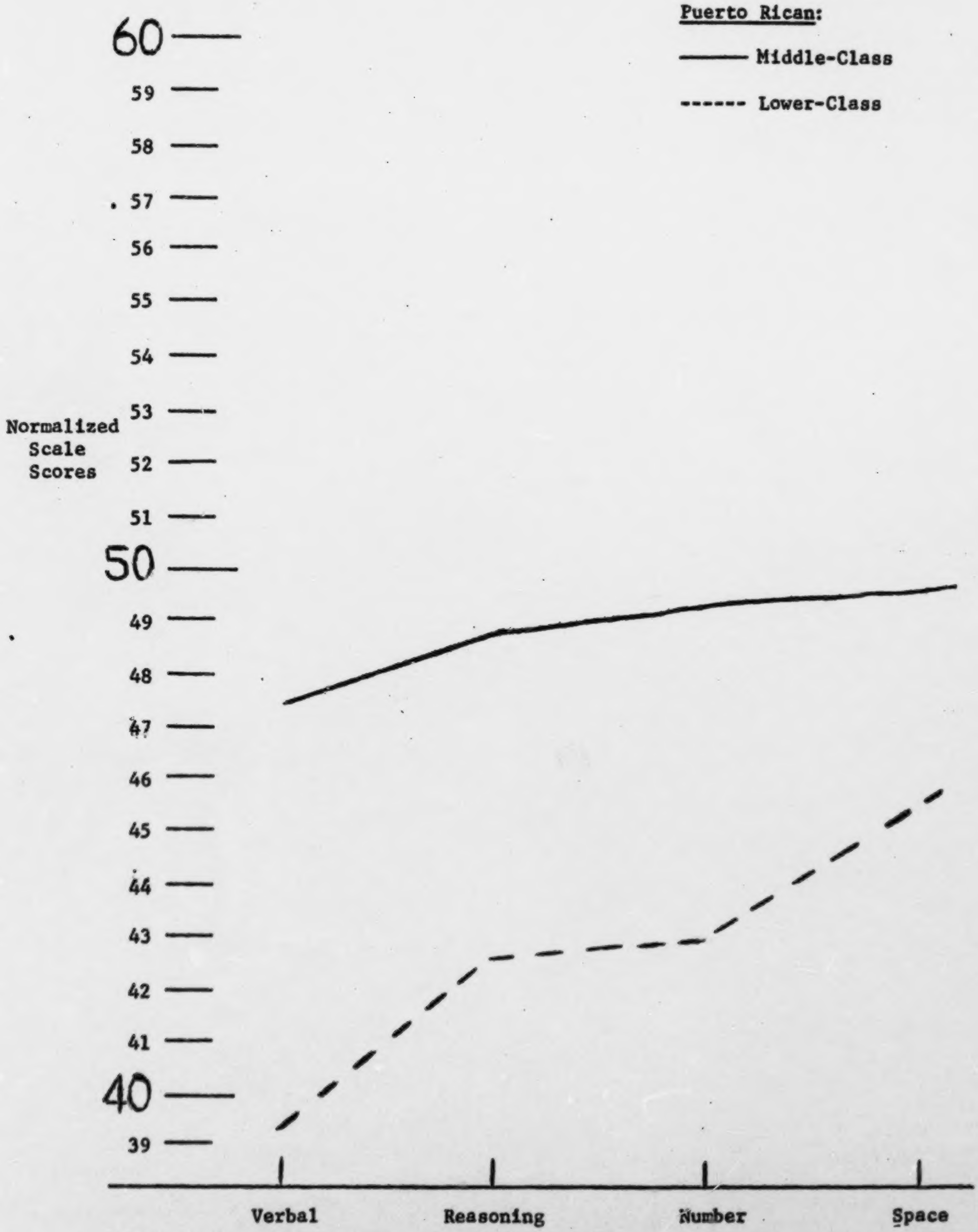

Fig. 6 Patterns of normalized mental-ability scores for middle-class and lower-class Puerto Rican children.

Table 45

Mean Normalized Scores for Each Ethnic Group Subdivided by Social Class

		Verbal	Reasoning	Number	Space
Chinese	Middle	51.20	55.95	56.00	56.75
	Lower	45.18	51.80	51.85	51.98
Jews	Middle	62.63	56.73	59.25	56.53
	Lower	54.73	48.50	50.18	47.03
Negro	Middle	55.78	53.90	51.25	52.88
	Lower	44.00	41.48	39.60	40.08
Puerto Rican	Middle	47.35	48.68	49.20	49.45
	Lower	39.30	42.53	42.95	45.28

Table 46

Analysis Of Variance of Pattern Differences Between Middle-Class And Lower-Class Chinese Children

Source	SS	dF	MS	F	p
Tests	2,076.576	3	692.192	10.47	<.001
Groups	1,824.050	1	1,824.050	21.84	<.001
Individuals	6,514.000	78	83.513		
Groups x Tests	46.875	3	15.625	0.24	—
Residual	15,464.050	234	66.085		
Total	25,925.550	319	81.271		

Table 47

Analysis of Variance of Pattern Differences Between Middle-Class And Lower-Class Jewish Children

Source	SS	dF	MS	F	p
Tests	2,276.112	3	758.704	20.70	<.001
Groups	6,020.450	1	6,020.450	58.22	<.001
Individuals	8,066.538	78	103.417		
Groups x Tests	32.876	3	10.959	0.30	—
Residual	8,577.012	234	36.654		
Total	24,972.988	319	78.285		

Table 48

Analysis of Variance of Pattern
Differences Between Middle-Class
And Lower-Class
Negro Children

Source	SS	dF	MS	F	p
Tests	881.812	3	293.937	7.41	<.001
Groups	11,834.112	1	11,834.112	86.31	<.001
Individuals	10,694.875	78	137.114		
Groups x Tests	17.764	3	5.921	0.15	—
Residual	9,285.925	234	39.683		
Total	32,714.488	319	102.553		

Table 49

Analysis Of Variance Of
Pattern Differences Between
Middle-Class And Lower-Class
Puerto Rican Children

Source	SS	dF	MS	F	p
Tests	680.584	3	226.861	6.14	<.001
Groups	3,031.953	1	3,031.953	14.84	<.001
Individuals	15,935.669	78	204.303		
Groups x Tests	150.410	3	50.137	1.35	—
Residual	8,638.756	234	36.918		
Total	28,707.372	319	89.992		

Interpretation

Hypotheses were tested regarding the influence of social class and ethnicity (and their interaction) upon the levels of four mental-ability scores and the patterns among them. The results may be summarized as follows:

		Effect upon Mental Abilities	
		Level	Pattern
Source of Influence	Social Class	Highly Significant	Non-Significant
	Ethnicity	Highly Significant	Highly Significant
	Social Class x Ethnicity	Significant	Non-Significant

Certain observations will be offered here for each of these findings considered separately. However, the major interpretative task is to seek an explanation for this particular configuration of findings when all hypotheses are considered simultaneously.

Social Class:

In this study, differences in social-class placement *do* produce marked differences in the absolute level of each mental ability (Tables 30-38) but *do not* produce discernible differences in the patterns among these abilities (Figure 1, Tables 41, 42).

Social-Class Effects upon Level of Mental Abilities:

The findings regarding social-class differences in the level of each mental ability extend downward the results of earlier studies on the mental abilities of older subjects (Havighurst and Breese, 1947*). This earlier research described significant differences among social-class groups for all the primary mental abilities studied in 13-year-olds (i.e., Number, Verbal Comprehension, Space, Word-Fluency, Reasoning, and Memory) and the present findings indicate that such consistently significant social-class differences exist for all mental abilities studied in a sample of 6-year-old children.

It was noted (p.9) that, while Havighurst and Breese (1947) report that higher-status children show superior scores for all mental ability variables, social-class differences were greatest for the Verbal, Word-Fluency, and Number factors and less striking for Space, Reasoning, and Memory. The present findings (Figure 1, Tables 32, 34, 36, 38, 41, 42) indicate no distinct variation among mental abilities in the size of the differences for 6-year-olds from the two social classes; all mental abilities show very similar degrees of separation between social-class groups.

Social-Class Effects upon Patterns among Mental Abilities:

Considering the pervasive impact and demonstrated power of social-class differences upon numerous sociological, psychological, and educational variables, (see p.7), the failure of the main-treatment effect of social class to affect patterns of ability is surprising. This failure must be interpreted in the light of the strong effects of ethnicity upon patterns and the absence of Social Class x Ethnicity interaction effects upon patterns which will be discussed in the next sections.

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*Havighurst, R.J., and Breese, F.H. Relation between ability and social status in a midwestern community. III. Primary Mental Abilities. J. educ. Psychol., 1947, 38, 241-247.

Ethnicity:

In this study, differences in ethnic-group membership do produce marked differences in both the absolute level of each mental ability (Tables 30-38) and in the patterns among the mental abilities (Figure 2, Tables 43, 44) .

Ethnicity Effects upon Level of Mental Abilities:

It was noted (p. 13-14) that earlier research suggests that Oriental children perform well on tests of spatial orientation but fall behind white American norms on verbal tests. The present data (Figure 2, Tables 39, 43, 44,) are consistent with this set of findings. The Chinese children are very strong in Space and considerably weaker, relative to the other groups, on Verbal ability.

Jewish children were described (p. 13) as generally superior on tests of verbal ability and this observation is supported here. The Verbal skills of the Jewish children (Figure 2, Tables 39, 43, 44) are clearly superior to the Verbal ability of other groups and to their own abilities in other intellectual areas.

It was also noted (pp. 12-13) that "Investigations on the American Negro have revealed a relatively large inferiority on . . . spatial functions, in comparison with most types of verbal tasks." (Anastasi, 1958, p. 565). The present data (Figure 2, Tables 39, 43, 44) confirm this observation. Relative to the other ethnic groups, Negro children are weak in Space (and Number) skills and average in Verbal ability.

Certain studies (e.g., Anastasi and deJesus, 1953) were described (p. 13) as suggesting strong verbal abilities in Puerto Rican children, while other investigations (e.g., Anastasi and Cordova, 1953) fail to confirm this. The present data (Figure 2, Tables 39, 43, 44) indicate that the Verbal skills of the Puerto Rican children are the weakest of all their mental abilities and compare unfavorably with the other groups. The Puerto Rican children show less weakness on the Space scale.

The low Verbal scores of the Chinese and Puerto Rican children may appear to be related to the relatively greater prevalence of bilingualism among these groups as compared to the Jewish and Negro children. Two observations militate against this explanation. First, comparison of the Verbal scores of the 51 bilingual Chinese children with the 29 Chinese children who spoke English only (see Table 6, p.46) shows a non-significant difference in favor of the bilingual group. (There were too few Puerto Rican children who spoke English only to permit a similar analysis for this group.) Second, the administration of the test materials in the child's primary language was intended to reduce the direct effects of bilingualism upon test results.

Ethnicity Effects upon Patterns among Mental Abilities:

The four ethnic groups differ not only in the level of each mental ability score, but (in contrast to the social-class groups) they differ in the pattern of scores as well. These differences in patterns among ethnic groups are particularly striking when social class is added to the ethnic groupings (Figures 3-6, Tables 45-49). Within each ethnic group, the middle-class children show a consistently higher level of scores than the lower-class children, but the patterns remain identical for both social-class groups. This reflects the finding (Figure 1, Tables 41, 42) that social-class differences do not produce different patterns of mental abilities. But what is even more important in view of the lamented confounding of class and caste so often found in research, we can state that the characteristics which determine the ethnic classification must be distinct from the characteristics which determine the social-class categories because of the clear differences in their effects upon patterns of ability. It does not seem sufficient therefore, to postulate as many investigators have done, that if only the various ethnic groups could be equated on the social-class variables, the differences in their intellectual performance would disappear. Differences among ethnic groups in the patterns of ability remain clearly evident.

The most direct interpretation of the ethnic-group differences in patterns of ability is that differential importance and emphasis is attached to these various mental skills in the different ethnic groups. Although numerous suggestions have been offered (Anastasi, 1958, pp. 505-631) concerning the mediating causes of cultural influence upon the development of mental abilities, it is perhaps the differential reinforcement in each culture for performance in each of the mental-ability areas which accounts most plausibly for the emergence of patterns of mental ability specific to each ethnic group. This interpretation will be discussed again in the following section dealing with the observed Social Class x Ethnicity interaction effects upon the levels but not the patterns of mental abilities.

Interactions Between Social Class and Ethnicity:

In this study, social-class and ethnic-group affiliation do interact to affect the absolute level of each mental ability (Tables 30-38, 40) but do not interact to affect the patterns among the mental abilities (Figures 3-6, Tables 45-49).

Interaction Effects upon Level of Mental Abilities:

The significant interactions affecting the level of each mental ability were described (p. 115) as resulting from the facts that (1) social-class position produces more of a difference in the mental abilities of Negro children than for the other ethnic groups, and (2) the scores of the middle-class children from the several ethnic groups resemble each other more than do the scores of the lower-class children from the several ethnic groups.

However, these interpretations of the Social Class x Ethnicity interactions demand a review of the problem (pp. 49-59) of maintaining equal separations between the social classes for all ethnic groups. The strategy was adopted in this study of using the "maximum" separation which could be located between the social classes for each ethnic group. This maximum separation was somewhat different for each ethnic group, and these differences may be assessed for the data described in Table 11 (p. 58) which indicates the total Index of Social Position for children in each social-class, ethnic, and sex group. One estimate of differences in maximum separation may be obtained by assigning weights, 1-5, to each of the Index of Social Position Classes I-V listed in Table 11. Multiplying these weights by the number of cases in each cell, the differences between middle-class and lower-class totals can be examined for each ethnic group. These estimates of differences for Chinese, Jewish, Negro, and Puerto Rican children are 124, 127, 123, and 93 respectively. There is, then, comparability of degrees of class separation for the Chinese (124), Jewish (127), and Negro (123) groups, but the middle-class Puerto Rican children are less widely separated from lower-class Puerto Rican children (93).

An associated problem is that while the Jewish children do show a degree of social-class separation similar to the Chinese and Negro children, the Jewish children fall at different points on the social-class continuum (Table 11). The Jewish middle-class children are mostly Class I; the Chinese and Negro middle-class children are mostly Class II. The Jewish lower-class children are equally divided in Classes IV and V; the Chinese and Negro lower-class children are almost all in Class V.

However, the Chinese and Negro children are almost identical in both the degree of separation between social-class groups and in the points at which the cases fall in the social-class distribution. Thus, the effects of Social Class x Ethnicity interactions can be observed most unequivocally when these two ethnic groups are compared. Mean scores and F-ratios for interaction effects are presented in Table 50.

The data in Table 50 indicate that, despite the almost identical degree of social-class separation for Chinese and Negro groups, the mental-ability differences are consistently greater for Negro than for Chinese children. It is also true that the middle-class Chinese and Negroes display more comparable scores (for all abilities except Verbal, where the middle-class Negroes are clearly superior to the middle-class Chinese) than do the lower-class Chinese and Negroes. When the 4 x 2 analyses of variance are reduced to 2 x 2 analyses which include only Chinese and Negro ethnic groups, F-ratios for the Social Class x Ethnicity interactions for each mental ability are significant beyond the .01 level of confidence (see Table 50). These observations permit some assurance that the significant Social Class x Ethnicity interactions are not artifacts of the equivocal social-class postions of Jewish and Puerto Rican groups, but remain when the two groups, which are almost identical in social-class placement, are considered alone.

Table 50

Mean Scores For Chinese And Negro Children For Each Social-Class Group

Verbal

	Ch.	N.	
Middle	76.8	85.7	81.3
Lower	65.3	62.9	64.1
	71.1	74.3	72.7

Class & Ethnicity F=7.69, p $<$.01

Reasoning

	Ch.	N.	
Middle	27.7	26.0	26.9
Lower	24.2	14.8	19.5
	25.9	20.4	23.2

Class & Ethnicity F=11.32, p $<$.01

Number

	Ch.	N.	
Middle	30.0	24.7	27.4
Lower	26.2	12.1	19.2
	28.1	18.4	23.3

Class & Ethnicity F=8.91, p $<$.01

Space

	Ch.	N.	
Middle	44.9	41.8	43.4
Lower	40.4	27.1	33.8
	42.7	34.4	38.6

Class & Ethnicity F=10.83, p $<$.01

Some evidence discussed earlier (pp. 17-18) suggested that the social-class influence upon intelligence is greater in white than in Negro groups. No distinct contrast with "white" children is available in this study, but the present evidence indicates that social-class influences upon the mental abilities of Negro children are very great as compared with the other ethnic groups represented here. One explanation for the apparent contrast between earlier and present findings is that the earlier research did not include middle-class and lower-class Negro groups which were distinctively different.

Thus, the effect of social class on the level of abilities is more powerful for the Negro group than for the Chinese (and apparently for the other ethnic groups as well). Two factors, either singly or in conjunction with each other, may be responsible for this result. First of all, the lower-class Negro group is more deprived in terms of the variables of family stability noted in Table 7 (p. 50). Secondly, the lower-class Negro is a member of a more isolated lower-class culture where fewer models are available for educational aspirations. The lower-class Negro child is likely to lack contact not only with the cultural majority, but with the middle-class Negro group as well. The Chinese child, on the other hand, comes from a more stable family unit (see Table 7, p. 50), is a member of a more unified cultural group where value is placed on education, and suffers less from isolation from middle-class models of his own ethnic origin. Thus, the disparity in the status of a middle- and lower-class child in relation to the cultural majority is perhaps much greater for Negroes than for Chinese.

Interaction Effects upon Patterns Among Mental Abilities:

While social class interacts with ethnicity to affect level of performance (Tables 30-38, 40), no such interaction effect is shown on the pattern of mental abilities (Figures 3-6, Tables 45-49). Ethnicity as a main treatment effect has a strong influence upon the organization of abilities (Figure 2, Tables 34, 44), but once the pattern specific to an ethnic group emerges, social-class variations within the ethnic group do not alter this basic pattern. The failure of social-class variations within each ethnic group to modify the basic ethnic patterns is depicted clearly in Figures 3-6 and Tables 45-49.

The failure of social-class conditions to transcend patterns of mental ability associated with ethnic influences is unexpected. Apparently, different mediators are associated with social-class conditions and ethnic-group conditions, and these mediators have different effects upon the organization of mental abilities. Anastasi (1958) and others have suggested numerous possible mediating factors linking cultural influences (whether social class or ethnic differences) and intellectual performance. Some possible mediators will be discussed next, but the present findings suggested the analysis of these mediators proceed in a special context: that mediating variables associated with ethnic conditions do affect the organization of abilities while social-class status does not appear to alter further the basic organization associated with ethnicity.

More exhaustive coverage of the mediating causes of cultural influence upon intelligence has been offered elsewhere (Anastasi, 1958, pp. 505-631), but at least three levels of explanation are usually proposed:

(1) That natural selection takes place which results in the placement of superior individuals in the middle class or in certain ethnic groups. This argument holds, for example, that the intellectual differences found among social-class groups result from a gradual hereditary differentiation which occurs through natural selection.

(2) That membership in a particular social class or ethnic group provides the kind of environment for the child which is most beneficial to maximum development of his various capabilities. This argument holds, for example, that the middle-class child, by and large, comes from a smaller and more stable family unit, where the father is present and interacts more with the children, where if the mother works, the child is provided with adequate substitute care, and where the child-rearing process is presumably less harsh and more verbal in nature.* Even outside the immediate middle-class family, adults are more available as sources of information and the child is freer to make use of these resources by asking questions and initiating contact.

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*For an extended discussion of the influence of child-rearing influences on the development of cognitive abilities see Bing, Elizabeth. Effect of childrearing practices on development of differential cognitive abilities. Child Develpm., 1963, 34, 631-648.

This argument holds, further, that the lower-class environment provides a more restricted range of environmental experiences, retarding intellectual development.

Bloom (1964)* has summarized the various child-rearing attitudes and practices which produce environmental effects upon the child's intellectual performance. Among the numerous home-environment variables mentioned are the parents' intellectual aspirations for the child, the reinforcements the parents offer for different types of intellectual performance, the opportunities provided for learning inside and outside the home, the value placed upon intellectual performance, and work habits emphasized in the home.

(3) That cultural conditions are related to mental abilities through the operation of other mediating factors which operate over and beyond the natural selection or environmental effects. A partial list of such suggested mediating factors follows; those factors over which some form of control has been exercised in this study are marked (C):

(a) Personality Variables:

e.g., self-concept
impulse control
persuasibility (C)
emotional problems (C)

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*Bloom, B.S. Stability and change in human characteristics. New York: Wiley, 1964.

dependency

(b) Cognitive Skills (other than mental abilities):

e.g., attention span (C)

perceptual discrimination

"generalized solution instruments" or problem-solving aids

learning "sets"

availability of linguistic codes

bilingualism (C)

(c) Cognitive Style:

e.g., speed of response (C)

impulsive *versus* reflective style

capacity for delay and deliberation

(d) Motivational Variables:

e.g., achievement motivation

effort and persistence (C)

expectations of success or failure

time orientation

(e) Test-Taking Influences:

e.g., familiarity with tests (C)

race of tester (C)

perceived importance ot test (C)

responsiveness to the tester (C)

(f) Peer-Group Influences:

(g) Formal-School Experiences: (C)

The present findings allow a more refined reassessment of these various explanations of social-class and cultural influences upon intellectual performance. This reassessment follows this principle: the importance of the mediators associated with ethnicity is to provide differential impacts upon the development of the different mental abilities while the importance of the mediators associated with social class is to provide pervasive (and not differential) effects upon the various mental abilities.

For example, the "natural selection" argument for social-class effects seems weakened by the fact that, once the ethnic pattern of the mental abilities emerges, no further alteration in this pattern occurs under the influence of differing social-class conditions. This observation appears to run counter to the natural selection explanation, for if such a selection occurred, it seems reasonable that certain areas of ability (for example, verbal skills which are related strongly to school performance) would be more powerful in "selecting" an individual into the middle-class group. This selection would affect, in turn, the pattern of abilities, with the verbal skills appearing much more prominently in the middle-class group than certain other skills. Thus, the natural-selection explanation would predict a differential pattern of social-class differences upon mental abilities. Results of this study do not support this observation and therefore weaken the explanation based on natural selection.

If the present findings weaken certain explanations, other explanations of social-class effects upon mental ability gain greater credence. Differences between social classes in motivation, impulse control, attention span, problem-solving tactics, or general responsiveness to the tester should pervade all areas of mental ability. If lower-class children are in general less motivated than middle-class children, or control their impulses less well, then an equal, pervasive depression of the scores of lower-class children in all mental ability areas can be expected. This explanation is consistent with present findings.

Since ethnicity has unequal, differential impacts upon different mental abilities, certain mediators represent plausible explanations for the processes which underlie the association between ethnicity and intellectual behavior. One such plausible explanation is based upon variations among ethnic groups in the history of differential reinforcement for learning different mental skills. There seems little doubt that different emphases among ethnic groups in the specific intellectual functions which are stimulated and encouraged are reflected in their different organizations of mental abilities.

The conclusion that the differential reinforcement offered by the ethnic group accounts for the differing patterns of scores is supported further by the data on pattern differences for boys and girls in the different ethnic groups presented in Appendix E.

If the differential-reinforcement explanation is correct, we would expect to find the pattern altered for girls in ethnic groups where differential treatment of boys and girls is pronounced. This is supported by the findings within the Puerto Rican group, where both the lower-class and the middle-class girls differ from the boys in their score profiles (Appendix E, Figure E5). The same variation between patterns for boys and girls can be seen in the lower-class Chinese group, although the middle-class Chinese group does not show this difference (Appendix E, Figure E2). (Perhaps for the middle-class Chinese the differential treatment of the sexes is not a salient part of the culture.) Neither the Jewish or Negro children show this marked difference between the sexes.

While the present findings add credence to the differential-reinforcement interpretation, other explanations of the effects of ethnicity upon learning are made less likely by the findings of this study. If impulse control or responsiveness to the tester become more plausible explanations of the social-class effects (because of the equal and pervasive effects of social class upon patterns of ability), the same explanations become less credible for ethnic-group effects (because of the unequal, differential effects of ethnic group upon patterns of ability).

In summary, the evidence of strong social-class and ethnic-group influences upon the level of each mental ability, and the emergence of a pattern of mental abilities specific to each ethnic group which remains unaltered by social-class position, lends selective support to Anastasi's premises that

> "Groups differ in their relative standing on different functions. Each . . . fosters the development of a different pattern of abilities." (Anastasi, 1958, p. 563)

It seems true that social class and ethnic groups do "... differ in their relative standing on different functions." However, ethnic groups do "...foster the development of a different pattern of abilities," while social-class differences do not modify these basic organizations associated with ethnic-group patterns.

Implications for Educational Practice:

No effort to add to knowledge about social-class and ethnic-group effects upon mental ability will have tangible or socially-useful educational outcomes unless accompanied by simultaneous, co-ordinated efforts to develop curricula, train teachers, modify social organization, and improve methods for establishing public policies regarding the schools. Each of the many educational efforts which affect children from culturally-diverse groups -- issues of measurement, curriculum, teacher training, school organization, and so forth -- has remained almost entirely divorced from the others. These studies seem to spin in their own orbits, each remaining theoretically or methodologically discrete, profiting little from each other's existence, and failing to feed any really useful information to the practitioner conducting daily classroom instruction. When innovations are attempted, they are introduced in one or another of these educational areas singly, with insufficient concern for how an attempted innovation in any one area will affect all the other parts of the educational system.

The present attempt to construct suitable testing procedures for studying children from culturally-diverse groups has not yet departed from this traditional isolation of educational efforts. We have not yet incorporated considerations of curriculum development, teacher training, and school organization as essential aspects of our test development and our results consequently have little immediate, direct applicability to the solutions of these problems.

However, the present study has taken the first step toward contributing to the solution of the broader educational problems: we have shown that several mental abilities are related to each other in ways which are culturally determined. We have been interested in identifying these abilities as distinct from the motivations, aspirations, and individual attitudes of the subjects. However, we have not yet attempted to relate these patterns of ability to school performance, but have proposed instead that the identification of relative strengths and weaknesses of members of different cultural groups is a basic and vital prerequisite to making enlightened decisions affecting the educational process and aims. The attempt to apply the present findings to the building of new school programs and the adaptation of old school practices to fit the knowledge of the patterns of abilities in culturally-diverse groups is the most compelling extension of this research.

Beyond the problem of incorporating these findings into broader educational plans and policies, other related issues seem promising and important:

(1) Investigations of the socio-cultural environments to determine which aspects of those environments are most salient for the development of different patterns of abilities. The following variables might provide a focus for such investigations.

(a) differential reinforcement
(b) natural selection
(c) adaptive solutions to minority group problems
(d) attention span
(e) availability of models
(f) cognitive style
(g) family interaction
(h) impulse control
(i) socialization methods
(j) independence training
(k) work methods

(2) Case studies of individuals within a socio-cultural group who show a marked adherence to or divergence from the norms of that group.

(3) Investigations of diverse mental abilities designed to further identify and isolate such abilities, determine the relationships among them and their relative contributions to the child's intellectual functioning.

Additional specific questions for study follow:

(1) Will the major finding of this study, that differential patterns of ability are related to ethnic-group differences, remain stable across age groups? That is, does ethnic-group membership continue to determine the pattern of abilities for children with increasing maturity and school experience? Do the relative strengths and weaknesses of the subjects represent different rates of learning which eventually level off to a more or less common mean for all groups or do they indeed represent a stable cognitive organization?

(2) Is there an optimal pattern among mental abilities which results in superior school performance? Or are different optimal patterns among mental abilities associated with superior school performance in different subject-matter areas? Can the child's abilities be differentially reinforced so that these optimal patterns can be produced? Or, conversely, should the educational program adjust itself to the relative strengths and weaknesses of the child?

(3) Is the learning process for each of the diverse mental abilities the same or different? Are these abilities developed in different ways with differentially suitable reinforcements?

(4) What is the effect of the development of one ability on that of another? Will an attempt to increase the level of one ability affect its relationship with other abilities?

(5) What effect does the presence of a tester of the same or different cultural group have on the test results for each child? In the present study, the use of a tester from the child's own cultural group may have served to maximize the responses most appropriate within the cultural group. Does the child adapt himself to a different set of expectations for different testers and is the child's cognitive functioning affected accordingly?

(6) Are the kinds of reinforcements necessary to maintain the development of abilities or to internalize long-term commitment to the application of these abilities relevant to the cultural-group reinforcements which first determine the child's pattern of mental abilities? How can this knowledge be most profitably incorporated into educational procedures?

References

Anastasi, Anne. The nature of psychological "traits." *Psychol. Rev.*, 1948, *55*, 127-133.

Anastasi, Anne. *Differential psychology*. New York: Macmillan, 1958a.

Anastasi, Anne. Heredity, environment, and the question "how?". *Psychol. Rev.*, 1958b, *65*, 197-208.

Anastasi, Anne. Cultural differences. In C. W. Harris (Ed.), *Encyclopedia of educational research*. New York: Macmillan, 1960a. Pp. 350-358.

Anastasi, Anne. Standardized ability testing. In P. H. Mussen (Ed.), *Handbook of research methods in child development*. New York: Wiley, 1960b. Pp. 456-496.

Anastasi, Anne. *Psychological testing*. New York: Macmillan, 1961.

Anastasi, Anne, and Cordova, F. A. Some effects of bilingualism upon the intelligence test performance of Puerto Rican children in New York City. *J. educ. Psychol.*, 1953, *44*, 1-19.

Anastasi, Anne, and D'Angelo, R. V. A comparison of Negro and white preschool children in language development and Goodenough Draw-a-Man I. Q. *J. genet. Psychol.*, 1952, *81*, 147-165.

Anastasi, Anne, and deJesus, C. Language development and Goodenough Draw-a-Man I. Q. of Puerto Rican preschool children in New York City. *J. abnorm. soc. Psychol.*, 1953, *48*, 357-366.

Angelino, H., and Shedd, C. L. An initial report of a validation study of the Davis-Eells Test of General Intelligence or Problem-Solving Ability. *J. Psychol.*, 1955, *40*, 35-38.

Atkinson, J. W. Motivational determinants of risk-taking behavior. *Psychol. Rev.*, 1957, *64*, 359-372.

Atkinson, J. W., Bastian, J. R., Earl, R. W., and Litwin, G. H. The achievement motive, goal-setting, and probability preferences. *J. abnorm. soc. Psychol.*, 1960, *60*, 27-36.

Atkinson, J. W., and Litwin, G. H. Achievement motive and test anxiety conceived as motive to approach success and motive to avoid failure. *J. abnorm. soc. Psychol.*, 1960, *60*, 52-63.

Avakian, Sonia. An investigation of trait relationships among six-year-old children. *Genet. Psychol. Monogr.*, 1961, *63*, 339-394.

Balinsky, B. An analysis of the mental factors of various age groups from 9 to 60. *Genet. Psychol. Monogr.*, 1941, *23*, 191-234.

Barber, B. *Social stratification*. New York: Harcourt, Brace and Co., 1957.

Bayley, Nancy, and Jones, H. E. Environmental correlates of mental and motor development: a cumulative study from infancy to six years. *Child Developm.*, 1937, *8*, 329-341.

Bendix, R., and Lipset, S. M. (Eds.). *Class, status, and power: a reader in social stratification*. Glencoe, Ill.: Free Press, 1953.

Bernstein, B. Language and social class. *Brit. J. Psychol*., 1960, *11*, 271-276.

Bernstein, B. Social class and linguistic development: a theory of social learning. In A. H. Halsey, Jean Floud, and C. A. Anderson (Eds.), *Education, economy and society*. Glencoe, Ill.: Free Press, 1961. Pp. 288-314.

Bloom, R., Whiteman, M., and Deutsch, M. Race and socio-economic status as separate environmental determiners. *Amer. Psychologist*, 1963, *18*, 347. (Abstract)

Brown, F. A comparative study of the intelligence of Jewish and Scandinavian kindergarten children. *J. genet. Psychol*., 1936, *49*, 325-342.

Bruce, M. Factors affecting intelligence test performance of whites and Negroes in the rural South. *Arch. Psychol*., 1940, No. 252.

Burt, C. The relations of educational abilities. *Brit. J. educ. Psychol*., 1939, *9*, 45-71.

Burt, C. *The factors of the mind: an introduction to factor analysis in psychology* New York: Macmillan, 1941.

Burt, C. Mental abilities and mental factors. *Brit. J. educ. Psychol*., 1944, *14*, 85-89.

Burt, C. The structure of the mind: a review of the results of factor analysis. *Brit. J. educ. Psychol*., 1949, *19*, 176-199.

Burt, C. The differentiation of intellectual ability. *Brit. J. educ. Psychol*., 1954, *24*, 76-90.

Canady, H. G. The effect of "rapport" on the IQ: a new approach to the problem of racial psychology. *J. Negro Educ*., 1936, *42*, 388-389.

Carmichael, L. The onset and early development of behavior. In L. Carmichael (Ed.) *Manual of child psychology*. New York: Wiley, 1954. Pp. 60-185.

Carroll, J. B. A factor analysis of verbal abilities. *Psychometrika*, 1941, *6*, 279-308.

Carroll, J. B. The factorial representation of mental ability and academic achievement. *Educ. psychol. Measmt*., 1943, *4*, 307-332.

Carson, A. S., and Rabin, A. I. Verbal comprehension and communication in Negro and white children. *J. educ. Psychol*., 1960, *51*, 47-51.

Cattell, R. B. *The IPAT Culture Fair Intelligence Scales*. Champaign, Ill.: Institute for Personality and Ability Testing, 1957.

Centers, R. T. *The psychology of social classes*. Princeton: Princeton Univer. Press, 1949.

Charters, W. W. Social class and intelligence tests. In W. W. Charters, and N. L. Gage (Eds.), *Readings in the social psychology of education*. Boston: Allyn and Bacon, 1963. Pp. 12-21.

Clark, M. P. Change inprimary mental abilities with age. *Arch. Psychologist*, 1944 No. 291.

Cloward, R. A., and Ohlin, L. E. *Delinquency and opportunity: a theory of delinquent gangs*. Glencoe, Ill.: Free Press, 1960.

Cohen, A. K. *Delinquent boys: the culture of the gang*. Glencoe, Ill.: Free Press, 1955.

Coleman, W., and Ward, A. H. A comparison of Davis-Eells and Kuhlmann-Finch scores of children from high and low socio-economic status. *J. educ. Psychol.*, 1955, *46*, 465-469.

Darsie, M. L. Mental capacity of American-born Japanese children. Comp. psychol. *Monogr.*, 1926, *15*, No. 3.

Davis, A. *Social class influences upon learning*. Cambridge: Harvard Univer. Press, 1948.

Davis, A. What are some of the basic issues in the relation of intelligence tests to cultural background? In K. Eells *et al*. *Intelligence and cultural differences*. Chicago: Univer. Chicago Press, 1951.

Davis, A., and Eells, K. *Davis-Eells Games: Davis-Eells Test of General Intelligence or Problem-Solving Ability, Manual*. Yonkers-on-Hudson, N.Y.: World Book, 1953.

Davis, A., and Havighurst, R. J. Social class and color differences in child-rearing. *Amer. sociol. Rev.*, 1946, *11*, 698-710.

Davis, A., and Hess, R. How fair is an IQ test? *Science Digest*, 1951, __, 43-47.

Davis, F. B., Lesser, G. S., French, Elizabeth G., *et al*. Identification and classroom behavior of gifted elementary-school children. *Cooperative Research Monographs*, 1960, No. 2, 19032. In "The Gifted Student," OE-35016, Monograph No. 2, U. S. Office of Education, Department of Health, Education, and Welfare.

Dreger, R. M. and Miller, K. S. Comparative psychological studies of Negroes and whites in the United States. *Psychol. Bull.*, 1960, *57*, 361-402.

Deutsch, M. P. The disadvantaged child and the learning process. In A. H. Passow (Ed.), *Education in depressed areas*. New York: Teachers College Publications 1963. Pp. 163-179.

Fillela, J. F. Educational and sex differences in the organization of abilities in technical and academic students in Columbia, South America. Unpublished doctoral dissertation, Fordham Univer., 1957.

Fowler, W. L. A comparative analysis of pupil performance on conventional and culture-controlled mental tests. *Yearbook of the National Council on Measurements Used in Education*, 1957, *14*, 8-19.

Freeman, F. S. *Theory and practice of psychological testing*. New York: Holt, Rinehart, and Winston, 1962.

French, Elizabeth G. The interaction of achievement motivation and ability in problem solving success. *J. abnorm. soc. Psychol.*, 1958, *57*, 306-309.

Furfey, P. H. The relationship between socio-economic status and intelligence of young infants as measured by the Linfert-Hierholzer scale. Ped. Sem. and J. genet. Psychol., 1928, 35, 478-480.

Garrett, H. E. A note on the intelligence scores of Negroes and whites in 1918. J. abnorm. soc. Psychol., 1945a, 40, 244-246.

Garrett, H. E. Psychological differences as among races. Science, 1945b, 101, 16-17.

Garrett, H. E. A developmental theory of intelligence. Amer. Psychologist, 1946, 1, 372-378.

Garrett, H. E. Negro-white differences in mental ability in the United States. Scient. Mon., 1947, 65, 329-333.

Garth, T. R., Elson, T. H., and Morton, M. M. Administration of non-language intelligence tests to Mexicans. J. abnorm. soc. Psychol., 1936, 31, 53-58.

Geist, H. Evaluation of culture-free intelligence. Calif. J. educ. Res., 1954, 5, 209-214.

Gesell, A., and Thompson, H. Learning and growth in identical twins: an experimental study by the method of co-twin control. Genet. Psychol. Monogr.. 1929, 6, 1-123.

Goslin, D. A. The search for ability. New York: Russell Sage Foundation, 1963.

Grooms, R. R., and Endler, N. S. The effect of anxiety on academic achievement. J. educ. Psychol., 1960, 51, 299-304.

Guilford, J. P. The structure of intellect. Psychol. Bull., 1956, 53, 267-293.

Guilford, J. P. A system of the psychomotor abilities. Amer. J. Psychol., 1958, 71, 164-174.

Guilford, J. P. Three faces of intellect. Amer. Psychologist, 1959, 14, 469-479.

Guthrie, G. M. Structure of abilities in a non-Western culture. J. educ. Psychol 1963, 54, 94-103.

Guttman, L. A new approach to factor analysis: radex. In P. F. Lazarsfeld (Ed.), Mathematical thinking in the social sciences. Glencoe, Ill.: Free Press, 1954. Pp. 258-348.

Haggard, E. A. Social-status and intelligence: an experimental study of certain cultural determinants of measured intelligence. Genet. Psychol. Monogr., 1954 49, 141-186.

Harding, J., Kutner, B., Proshansky, H., and Chein, I. Prejudice and ethnic relations. In G. Lindzey (Ed.), Handbook of social psychology. Cambridge: Addison-Wesley, 1954. Pp. 1021-1061.

Havighurst, R. J., Gunther, Minna K., and Pratt, Inez E. Environment and the Draw-a- Man Test: the performance of Indian children. J. abnorm. soc. Psychol., 1946, 41, 50-63.

Havighurst, R. J., and Janke, L. L. Relationbetween ability and social status in a midwestern community. I. Ten-year-old children. *J. educ. Psychol.*, 1944, *35*, 357-368.

Held, O. C. A comparative study of the performance of Jewish and gentile college students on the American Council Psychological Examination. *J. soc. Psychol.*, 1941, *13*, 407-411.

Herrick, V. E. What is already known about the relationship of the I. Q. to cultural background? In K. Eells, A. Davis, R. J. Havighurst, V. E. Herrick, and R. W. Tyler, *Intelligence and cultural differences*. Chicago: Chicago Univer. Press, 1951.

Herzberg, F., and Lapkin, M. A study of sex differences on the Primary Mental Abilities test. *Educ. psychol. Measmt.*, 1954, *14*, 687-689.

Hill, H. S. The effects of bilingualism on the measured intelligence of elementary school children of Italian parentage. *J. exp. Educ.*, 1936, *5*, 75-79.

Hobson, J. R. Sex differences in primary mental abilities. *J. educ. Res.*, 1947, *41*, 126-132.

Hoffman, Lois W., and Lippitt, R. The measurement of family life variables. In P. H. Mussen (Ed.), *Handbook of research methods in child development*. New York: Wiley, 1960. Pp. 945-1013.

Hollingshead, A. B., and Redlich, F. C. *Social class and mental illness*. New York: Wiley, 1958.

Hotelling, H. Analysis of a complex of statistical variables into principal components. *J. educ. Psychol.*, 1933, *24*, 417-441.

Hunt, J. McV. *Intelligence and experience*. New York: Ronald, 1961.

Hsu, F. L. K. (Ed.). *Psychological anthropology*. Homewood: Dorsey Press, 1961.

Husen, T. The influence of schooling. *Theoria*, 1951, *17*, 61-88.

Irwin, O. C. Infant speech: The effects of family occupational status and of age on the use of sound types. *J. Speech Hearing Disorders*, 1948, *13*, 224-226.

Janke, L. L., and Havighurst, R. J. Relation between ability and social status in a midwestern community. II. Sixteen-year-old boys and girls. *J. educ. Psychol.*, 1945, *36*, 499-509.

Jones, W. R. A critical study of bilingualism and nonverbal intelligence. *Brit. J. educ. Psychol.*, 1960, *30*, 71-76.

Jones, W. R., and Stewart, W. A. Bilingualism and verbal intelligence. *Brit. J. Psychol.*, 1951, *4*, 3-8.

Kaplan, B. (Ed.). *Studying personality cross-culturally*. Evanston: Row, Peterson, 1961.

Kelley, T. L. *Crossroads in the mind of man: a study of differentiable mental abilities*. Stanford: Stanford Univer. Press, 1928.

Kelley, T. L. *Essential traits of human life*. Cambridge: Harvard Univer. Press, 1935.

Kinsey, A. C., Pomeroy, W. B., and Martin, C. E. *Sexual behavior in the human male*. Philadelphia: Saunders, 1948.

Klineberg, O. An experimental study of speed and other factors in "racial" differences. *Arch. Psychol.*, 1928, No. 93.

Klineberg, O. *Race differences*. New York: Harper, 1935.

Klineberg, O. *Characteristics of the American Negro*. New York: Harper, 1944.

Klineberg, O. Negro-white differences in intelligence test performance: a new look at an old problem. *Amer. Psychologist*, 1963, *18*, 198-203.

Kluckhohn, C. Culture and behavior. In G. Lindzey (Ed.), *Handbook of social psychology*. Cambridge: Addison-Wesley, 1954. Pp. 921-976.

Kostik, M. M. A study of transfer: sex differences in the reasoning process. *J. educ. Psychol.*, 1954, *45*, 449-458.

Lee, E. S. Negro intelligence and selective migration: a Philadelphia test of the Klineberg hypothesis. *Amer. soc. Rev.*, 1951, *16*, 227-233.

Lee, E. S. Negro intelligence and selective migration: a Philadelphia test of the Klineberg hypothesis. *Amer. soc. Rev.*, 1951, *49*, 19-42.

Lerner, E. *Constraint areas and the moral judgment of children*. Menasha, Wis.: Banta, 1937.

Lesser, G. S. The relationships between various forms of aggression and popularity among lower-class children. *J. educ. Psychol.*, 1959, *50*, 20-25.

Lesser, G. S., Davis, F. B., and Nahemow, Lucille. Identification of gifted elementary school children with scientific talent. *Educ. psychol. Measmt.*, 1962, *22*, 349-364.

Lesser, G. S., Krawitz, Rhoda, and Packard, Rita. Experimental arousal of achievement motivation in adolescent girls. *J. abnorm. soc. Psychol.*, 1963, *66*, 59-66.

Levinson, B. M. A comparison of the performance of bilingual and monolingual native-born Jewish pre-school children of traditional parentage on four intelligence tests. *J. clin. Psychol.*, 1959, *15*, 74-76.

Lindzey, G. (Ed.). *Projective techniques and cross-cultural research*. New York: Appleton-Century-Crofts, 1961.

Loevinger, Jane. On the proportional contributions of differences in nature and in nurture to differences in intelligence. *Psychol. Bull.*, 1943, *40*, 725-756.

Lorge, I. Schooling makes a difference. *Teach. Coll. Rec.*, 1945, *46*, 483-492.

Lorge, I. Difference or bias in tests of intelligence? In *Proceedings of the 1952 Invitational Conference on Testing Problems*. Princeton: Educational Testing Service, 1953. Pp. 76-83.

McCarthy, Dorothea. Language development in children. In L. Carmichael (Ed.), Manual of child psychology. New York: Wiley, 1954. Pp. 492-630.

McClelland, D. C. Issues in the identification of talent. In D. C. McClelland, A. L. Baldwin, U. Bronfenbrenner, and F. L. Strodtbeck, Talent and society. Princeton: Van Nostrand, 1958. Pp.1-28.

McClelland, D. C. The achieving society. New York: Van Nostrand, 1961.

McClelland, D. C., Atkinson, J. W., Clark, R. A., and Lowell, E. L. The achievement motive. New York: Appleton-Century-Crofts, 1953.

McGurk, F. C. J. Comparison of the performance of Negro and white high school seniors on cultural and non-cultural psychological test questions. Washington, D. C.: Catholic Univer. America Press, 1951.

McNemar, Q. The revision of theStanford-Binet Scale: an analysis of the standardization data. Boston: Houghton Mifflin, 1942.

Meyers, C. E., and Dingman, H. F. The structure of abilities at the preschool ages: hypothesized domains. Psychol. Bull., 1960, 57, 514-532.

Meyers, C. E., Orpet, R. E., Attwell, A. A., and Dingman, H. F. Primary abilities at mental age six. Monogr. Soc. Res. Child Developm., 1962, 27, No. 1.

Mitchell, J. V. A comparison of the factorial structure of cognitive functions for a high and low status group. J. educ. Psychol., 1956, 47, 397-414.

Murray, W. Some major assumptions underlying the development of intelligence tests. Unpublished paper, 1960.

Noll, V. H. Relation of scores on Davis Eells Games to socio-economic status, intelligence test results, and school achievement. Educ. psychol. Measmt., 1960, 20, 119-130.

O'Doherty, E. F. Bilingualism: Educational aspects. Advanc. Sci., 1958, 56, 287-290.

Owens, W. A. Age and mental abilities: a longitudinal study. Genet. Psychol. Monogr., 1953, 48, 3-54.

Passow, A. H. (Ed.). Education in depressed areas. New York: Teachers College Publications, 1963.

Peal, Elizabeth, and Lambert, W. E. The relation of bilingualism to intelligence. Psychol. Monogr., 1962, 76, No. 27.

Phares, J. E., and Rotter, J. B. The effect of the situation on psychological testing. J. consult. Psychol., 1956, 20, 291-293.

Piaget, J. The psychology of intelligence. London: Routledge and Kegan Paul, 1947.

Pintner, R., and Arsenian, S. The relation of bilingualism to verbal intelligence and school adjustment. J. educ. Res., 1937, 31, 255-263.

Porteus, S. D. Racial group differences in mentality. *Tabul. biol., Haag*, 1939, *18*, 66-75.

Porteus, S. D., and Babcock, M. E. *Temperament and race*. Boston: Gorham, 1926.

Riessman, F. *The culturally deprived child*. New York: Harper, 1962.

Roberts, S. O., and Robinson, J. M. Intercorrelations of the Primary Mental Abilities Tests for ten-year-olds by socio-economic status, sex, and race. *Amer. Psychologist*, 1952, *7*, 304-305.

Robinson, Mary L., and Meenes, M. The relationship between test intelligence of third grade Negro children and the occupations of their parents. *J. Negro. Educ.*, 1947, *16*, 136-141.

Rosen, B. C. The achievement syndrome: A psychocultural dimension of social stratification. *Amer. sociol. Rev.*, 1955, *21*, 203-211.

Rosenblum, S., Keller, J. E., and Papania, N. Davis-Eells ("culture-fair") test performance of lower-class retarded children. *J. consult. Psychol.*, 1955, *19*, 51-54.

Russell, R. W. The spontaneous and instructed drawings of Zuni children. *J. comp. Psychol.*, 1943, *35*, 11-15.

Sarason, I. G., and Minard, J. Interrelationships among subject,experimenter, and situational variables. *J. abnorm. soc. Psychol.*, 1963, *67*, 87-91.

Sarason, I. G. Individual differences, situational variables, and personality research. *J. abnorm. soc. Psychol.*, 1962, *65*, 376-380.

Sarason, S. B., Lighthall, F. F., Davidson, K. S., and Waite, R. R. *Anxiety in elementary school children*. New York: Wiley, 1960.

Scarlett, F. M. Opinion and judgment in Civil Action No. 1316. *U. S. District Court for the Southern District of Georgia*, June 28, 1963.

Seashore, H. A., Wesman, A. G., and Doppelt, J. The standardization of the Wechsler Intelligence Scale for Children. *J. consult. Psychol.*, 1950, *14*, 99-110.

Semler, I. J., and Iscoe, I. Comparative and developmental study of the learning abilities of Negro and white children under four conditions. *J. educ. Psychol* 1963, *54*, 38-44.

Shaw, C. R., and McKay, H. D. *Juvenile delinquency in urban areas*. Chicago: Univer. Chicago Press, 1942.

Shuey, Audrey M. *The testing of Negro intelligence*. Lynchburg, Va.: J. P. Bell, 1958.

Smith, Madorah E. Measurement of vocabularies of young bilingual children in both of the languages used. *J. genet. Psychol.*, 1949, *74*, 305-310.

Smith, Madorah E. Word variety as a measure of bilingualism in preschool children *J. genet. Psychol.*, 1957, *90*, 143-150.

Smith, W. F., and Rockett, F. C. Test performance as a function of anxiety, instructor, and instructions. *J. educ. Res.*, 1958, *52*, 138-141.

Spindler, G. D. (Ed.). *Education and culture: anthropological approaches.* New York: Holt, Rinehart, and Winston, 1963.

Stablein, J. E., Willey, D. S., and Thanson, C. W. An evaluation of the Davis-Eells (Culture Fair) Test using Spanish and Anglo-American children. *J. educ. Sociol.*, 1961, *35*, 73-78.

Strodtbeck, F. L. Family, interaction, values, and achievement. In D. C. McClelland, A. L. Baldwin, U. Bronfenbrenner, and F. L. Strodtbeck, *Talent and society*. Princeton: Van Nostrand, 1958. Pp. 135-194.

Sweeny, E. J. Sex differences in problem solving. *Stanford Univer. Dept. Psychol Tech. Rep. No. 1*, 1953.

Swineford, Frances. A study in factor analysis: the nature of the general, verbal and spatial bi-factors. *Suppl. educ. Monogr.*, 1948, No. 67.

Swineford, Frances. General, verbal, and spatial bi-factors after three years. *J. educ. Psychol.*, 1949, *40*, 353-360.

Tanser, H. A. *The settlement of Negroes in Kent County, Ontario.* Chatham, Ontario: Shephard Publ. Co., 1939.

Templin, Mildred C. *Certain language skills in children: their development and interrelationships.* Minneapolis: Univer. of Minn. Press, 1957.

Terman, L. M., and Tyler, Leona E. Psychological sex differences. In L. Carmichael (Ed.), *Manual of child psychology.* New York: Wiley, 1954. Pp. 1064-1114.

Thurstone, L. L. Primary mental abilities. *Psychometr. Monogr.*, 1938, No. 1.

Thurstone, L. L. *Multiple-factor analysis.* Chicago: Univer. Chicago Press, 1947.

Thurstone, L. L. Psychological implications of factor analysis. *Amer. Psychologist*, 1948, *3*, 402-408.

Thurstone, L. L., and Thurstone, Thelma G. Factorial studies of intelligence, *Psychometr. Monogr.*, 1941, No. 2

Thurstone, L. L., and Thurstone, Thelma G. *The Chicago Tests of Primary Mental Abilities.* Chicago: Science Research Associates, 1943.

Thurstone, L. L., and Thurstone, Thelma G. *SRA Primary Mental Abilities.* Chicago: Science Research Associates, 1958.

Tyler, Leona E. The relationship of interests to abilities and reputation among first-grade children. *Educ. psychol. Measmt.*, 1951, *11*, 255-264.

Veblen, T. *The theory of the leisure class.* New York: Huebsch, 1918.

Vernon, P. E. *The structure of human abilities.* London: Methuen, 1950.

Vernon, P. E., and Parry, J. B. *Personnel selection in the British Forces.* London: Univer. London Press, 1949.

Warner, W. L., Meeker, Marchia, and Eells, K. Social class in America. Chicago: Science Research Associates, 1949.

Warner, W. L., and Lunt, P. S. The social life of a modern community. New Haven: Yale Univer. Press, 1941.

Warrington, W. G., and Saupe, J. L. Development and applications of tests of general mental ability. Rev. educ. Res., 1959, 29, 19.

Weinreich, U. Languages in contact. New York: Linguistic Circle of New York, 1953.

Wesman, A. G. Separation of sex groups in test reporting. J. educ. Psychol., 1949, 40, 223-229.

Weyl, N. The Negro in American civilization. Washington, D. C.: Public Affairs Press, 1960.

Whiting, J. W. M. The cross-cultural method. In G. Lindzey (Ed.), Handbook of social psychology. Cambridge: Addison-Wesley, 1954. Pp. 523-531.

Whiting, J. W. M., and Child, I. L. Child training and personality. New Haven: Yale Univer. Press, 1953.

Whiting, J. W. M., and Whiting, Beatrice. Contributions of anthropology to the methods of studying child rearing. In P. H. Mussen (Ed.), Handbook of research methods in child development. New York: Wiley, 1960. Pp. 918-944.

Winterbottom, Marian R. The relation of need for achievement to learning experiences in independence and mastery. In J. W. Atkinson (Ed.), Motives in fantasy, action, and society. Princeton: Van Nostrand, 1958. Pp. 453-478.

Witkin, H. A. et al. Personality through perception. New York: Harper, 1954.

Wolfle, D. America's resources of specialized talent. New York: Harper, 1954.

Wolfle, D. Diversity of talent. Amer. Psychologist, 1960, 15, 535-545.

APPENDIX A
DIRECTIONS FOR ADMINISTRATION OF TESTS OF MENTAL ABILITY
VOCABULARY

I. PICTURE VOCABULARY

Administer all items.

Introduce test by saying:

I HAVE SOME PICTURES TO SHOW YOU. I WANT YOU TO LOOK AT THEM AND TELL ME WHAT THEY ARE.

Nouns:

Say: WHAT IS THIS?

If child gives function or description of object:

Say: WHAT IS IT CALLED?

If child does not know name of object, or gives incorrect or unclear response:

Say: TELL ME ABOUT IT.

Verbs:

Say: TELL ME IN ONLY ONE WORD WHAT THESE PEOPLE ARE DOING.

If child gives description:

Say: TELL ME IN ONLY ONE WORD.

If child does not know name of activity, or gives incorrect or unclear response:

Say: TELL ME ABOUT IT.

VOCABULARY

II. VERBAL VOCABULARY

Stop after 4 consecutive complete failures.

Introduce test by saying:

I HAVE SOME WORDS HERE AND I WANT YOU TO TELL ME WHAT THEY MEAN.

Sample:

Say: WHAT IS AN APPLE?

When child answers correctly or incorrectly,

Say: YES (use child's definition)) AND IT'S SOMETHING TO EAT, IT HAS SEEDS, IT'S JUICY, IT GROWS ON TREES, AND IT'S A FRUIT.
NO)

NOW TELL ME WHAT THESE WORDS MEAN.

Nouns:

Say: WHAT IS A ______?

Others:

Say: WHAT DOES ______ MEAN?

Or: WHAT DO WE MEAN WHEN WE USE THE WORD _____?

If child does not adequately define a word,

Say: TELL ME MORE ABOUT _____?

+ TELL ME WHAT YOU MEAN.

TAKE A GUESS.

If child defines a similar-sounding word,

Say: LISTEN CAREFULLY. WHAT DOES ____ MEAN?

(This applies most frequently to: BIRD - BIRTH
SHARP - SHARK
SUFFER - SUFFOCATE)

If child defines a homonym,

Say: WHAT ELSE DOES _____ MEAN?

(This applies to: BIRTH - BERTH
FLOWER - FLOUR)

REASONING

I. PICTURE ANALOGIES

Stop after 3 consecutive failures.

Introduce test by saying:

NOW LET'S TRY SOMETHING DIFFERENT.

Show Sample 1. Cover choice card with cardboard. Say:

SEE THESE PICTURES? SEE HOW THIS GOES WITH THIS? SEE THIS PICTURE? WHICH OF THESE PICTURES (Pointing to choices) GOES HERE WITH THIS PICTURE THE SAME WAY THIS GOES WITH THIS?

(If child answers before instructions are completed, tell him to wait until you have finished, and complete the directions.)

If correct, say:

YES, THE LITTLE ONE GOES WITH THE BIG ONE THE SAME WAY THIS LITTLE ONE GOES WITH THIS BIG ONE.

If incorrect, ask child to name items. Include idea of "big" and "little" if child does not, e.g., if child says, "It's a dog," point out: IT'S A BIG DOG. Say:

SEE HOW THIS LITTLE ______ GOES WITH THIS BIG _____? WHICH ONE OF THESE PICTURES GOES WITH THIS BIG _____ THE SAME WAY THIS LITTLE _______ GOES WITH THIS BIG _____? (Using child's terms.)

Let child choose again.

If child fails again, explain analogy using child's terms.

Show Sample 2.

Presentation same as Sample 1.

If correct, say: YES, THE MAN'S HAT GOES WITH THE BOY'S HAT THE SAME WAY THE MAN GOES WITH THE BOY.

If incorrect, the same as for Sample 1, again incorporating the child's terms in stating the analogy.

Show Item 1. Presentation same as for Sample 1.

For remaining items, say at each presentation:

> SEE HOW THIS GOES WITH THIS? WHICH ONE OF THESE (uncover choices and point) GOES WITH THIS ONE?

When child fails an item, say on succeeding item:

> SEE HOW THIS GOES WITH THIS? WHICH ONE OF THESE PICTURES GOES WITH THIS PICTURE IN THE SAME WAY THAT THIS GOES WITH THIS?

REASONING

II. PICTURE ARRANGEMENT

Stop after 3 consecutive failures.

Introduce test by saying:

LET'S LOOK AT THESE PICTURES

Sample: Lay out sample cards from left to right in numerical order as indicated on the back of the cards, and say:

THESE PICTURES TELL A STORY ABOUT A LITTLE BOY WHO PAINTED A CHAIR, BUT THE PICTURES ARE MIXED UP. I'D LIKE TO HAVE YOU PUT THE PICTURES IN A LINE SO THAT THEY WILL TELL A GOOD STORY.

When child appears to have completed, ask:

HAVE YOU FINISHED MAKING A GOOD STORY?

If correct, say: GOOD, HERE HE STARTS TO PAINT THE CHAIR. HERE HE IS PAINTING THE CHAIR. HERE HE HAS FINISHED AND IS LOOKING AT THE CHAIR.

If incorrect say: WATCH ME AND SEE HOW I PUT THEM IN A LINE TO MAKE A GOOD STORY.

Put picture in correct order, saying after it is done:

HERE HE STARTS TO PAINT. HERE HE IS PAINTING. HERE HE HAS FINISHED AND IS LOOKING AT THE CHAIR.

Readminister the sample and let child do it alone.

Say: TRY IT AGAIN

Next say: NOW TRY ANOTHER STORY.

Present Item 1 and say: NOW PUT THESE IN A LINE SO THAT THEY WILL MAKE A GOOD STORY.

Continue in the same way with the remainder of the items. When the child appears to have completed each item, ask:

HAVE YOU FINISHED MAKING A GOOD STORY? unless child has verbalized a story.

REASONING

III. JUMP PEG

Stop after 3 consecutive items on which more than 1 peg remains.

Introduce test by saying:

HERE IS A GAME THAT'S FUN.

Set up two-peg demonstration and say:

THIS IS A GAME IN WHICH YOU JUMP OVER PEGS.

YOU JUMP ONLY ALONG THE STRAIGHT BLACK LINES.

WHEN YOU JUMP OVER A PEG, YOU TAKE IT AWAY.

YOU CAN ONLY JUMP WHEN THE PEGS ARE IN HOLES RIGHT NEXT TO EACH OTHER.

WHEN YOU FINISH, YOU WANT ONLY ONE PEG LEFT, AND THAT PEG SHOULD BE IN THE RED HOLE IN THE CENTER.

State only when necessary:

YOU CANNOT JUMP WHEN THERE IS A HOLE BETWEEN THE PEGS.

Or, YOU CAN MOVE ONLY BY JUMPING OVER ANOTHER PEG.

If child is reminded of checkers, say:

THIS IS A GAME YOU PLAY BY YOURSELF.

Present Sample 1 and say: YOU TRY THIS ONE.

If correct, Present Sample 2.

If incorrect, 1. Demonstrate and explain, then readminister.

If incorrect on second trial

2. Demonstrate and explain, then readminister.

If incorrect on third trial:

3. Explain, administer Sample 2.

Present Sample 2.

If correct, present test items.

If incorrect,

1. Demonstrate and explain, then readminister.

   If incorrect on second trial:

2. Demonstrate and explain, then readminister.

   If incorrect on third trial:

3. Explain, administer Item 1.

Present test items and say:

YOU WANT TO HAVE ONLY ONE PEG LEFT AND THAT PEG SHOULD BE IN THE RED HOLE IN THE CENTER. TAKE YOUR TIME.

At any point in the test, the examiner may correct the child's mistakes by repeating the relevant part of the instructions. ONE REMINDER OF EACH RULE FOR EACH ITEM IS THE MAXIMUM. Remove item and administer next one. However, child may be reminded as often as necessary to remove a peg after he has jumped over it. The examiner may do this if child is not reminded in time.

If child has several pegs left that are not next to each other, examiner may end the game by saying:

YOU CAN'T JUMP ANY MORE BECAUSE THERE ARE NO PEGS NEXT TO EACH OTHER.

When child indicates he is finished although there are additional possible moves, remove pegs and say:

REMEMBER, YOU WANT TO HAVE ONLY ONE PEG LEFT AND THAT PEG SHOULD BE IN THE RED HOLE IN THE CENTER.

Present next item as usual.

REASONING

JUMP PEG PATTERNS

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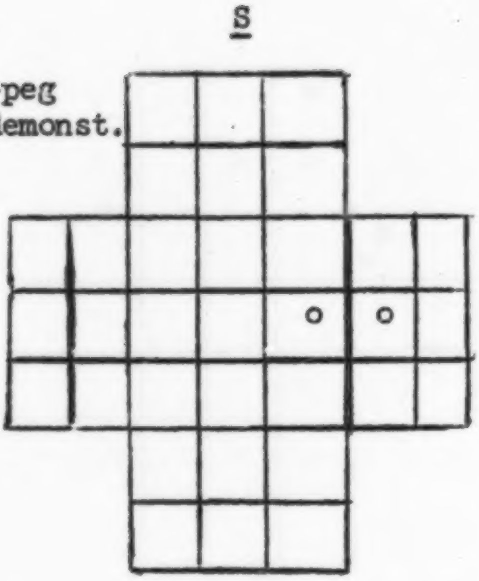

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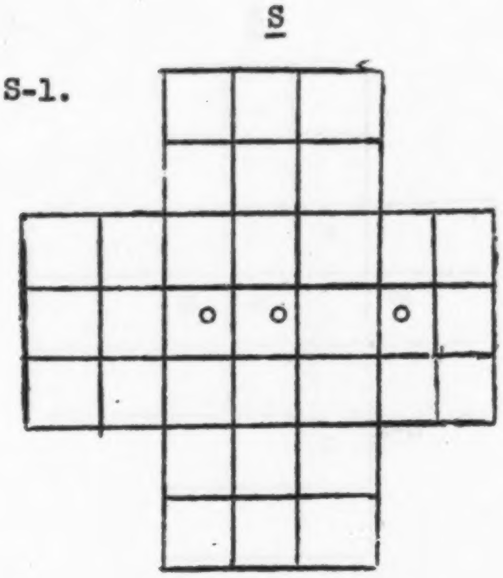

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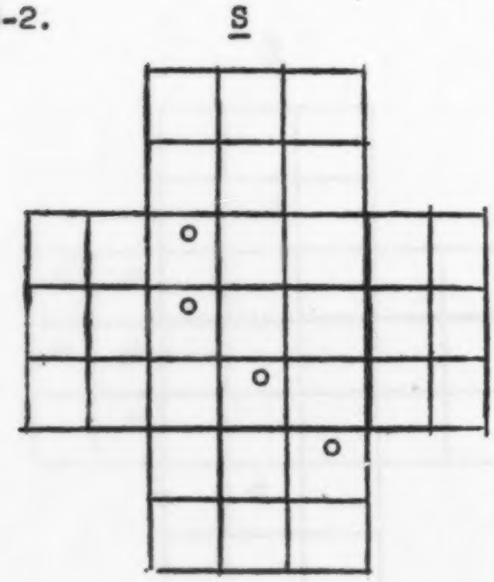

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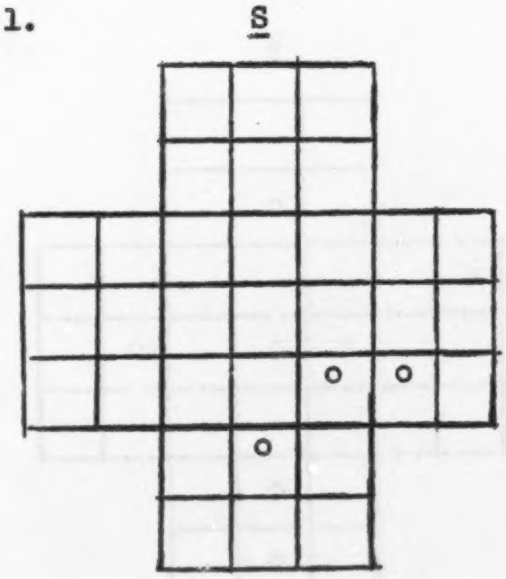

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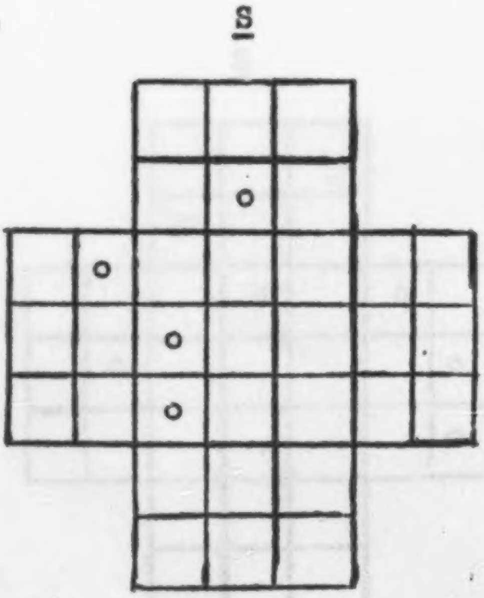

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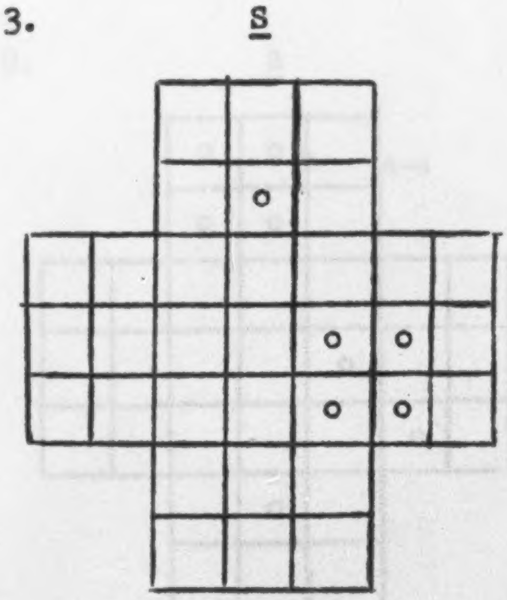

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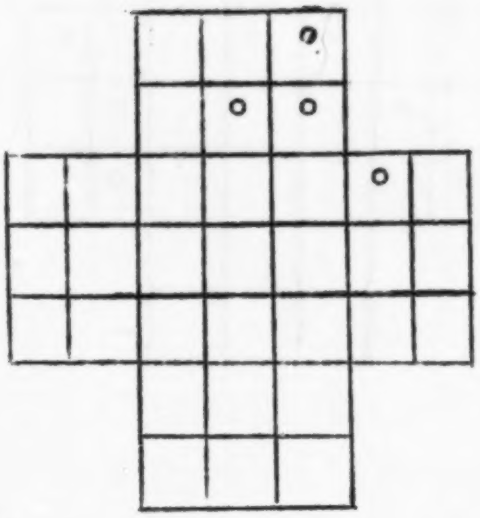

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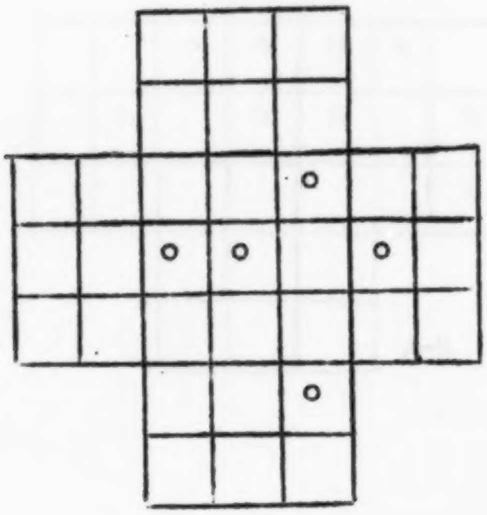

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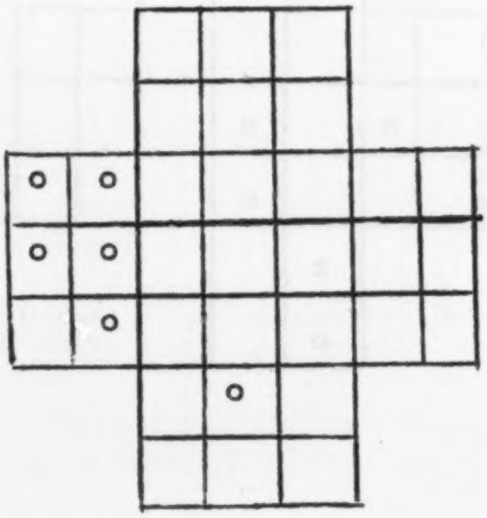

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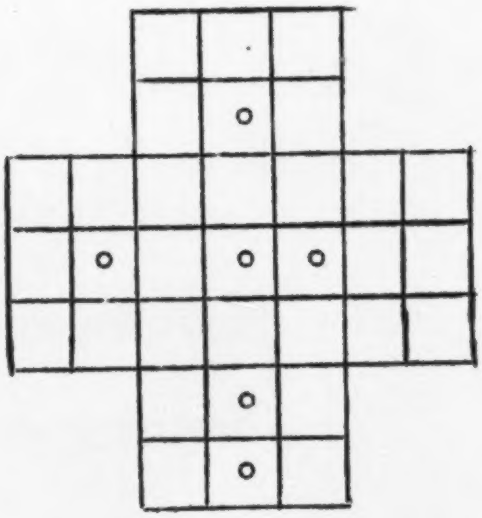

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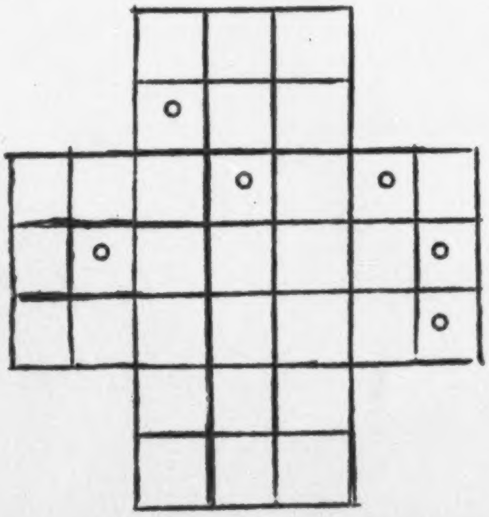

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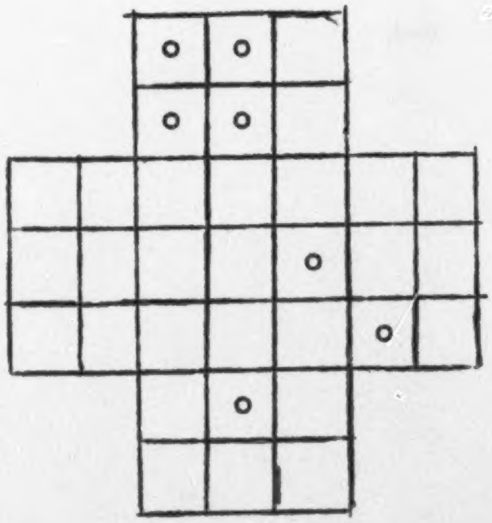

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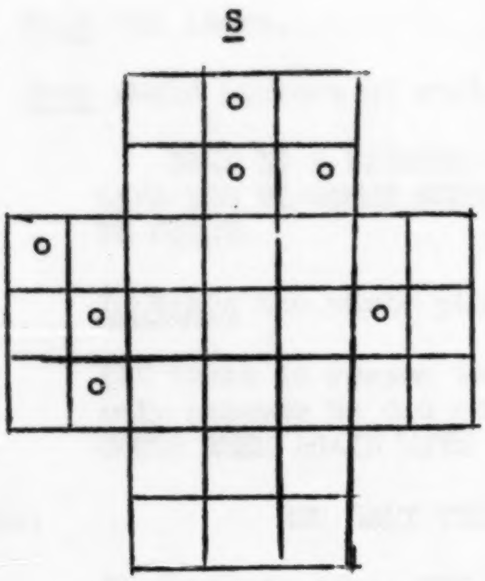

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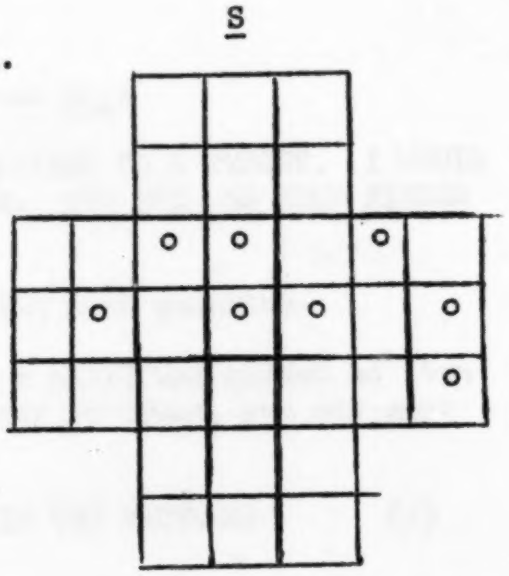

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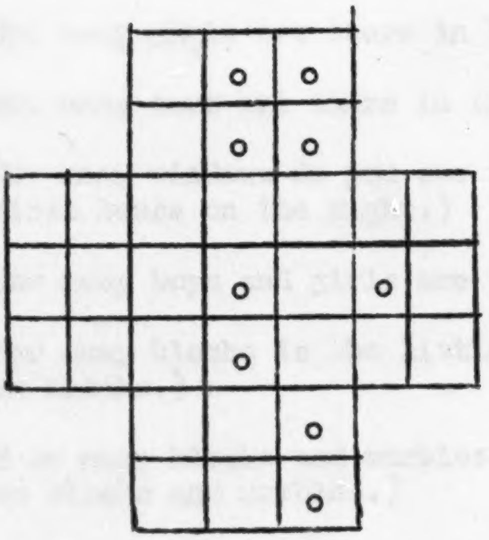

NUMERICAL TEST

I. ENUMERATION

Give all items.

Show child picture of children playing and say:

HERE IS A PICTURE OF CHILDREN PLAYING ON A STREET. I WOULD LIKE YOU TO COUNT SOME THINGS FOR ME. YOU MAY SE YOUR FINGER TO COUNT.

Indicate the whole picture when asking each question.

(If there is reason to believe that a child has missed an item only because he did not use his finger to count, you may say: COUNT THEM AGAIN WITH YOUR FINGER.)

Sample: HOW MANY TREES ARE THERE IN THE PICTURE? (2)

If correct, say: YES,)
THERE ARE TWO TREES.
If incorrect, say: NO)

1. How many girls are there in the picture? (3)
2. How many cars are there in the picture? (5)
3. How many windows do you see in this house? (Point to the first house on the right.) (9)
4. How many boys and girls are there altogether? (7)
5. How many blocks is the little girl playing with? (Point to blocks.) (13)
6. H ow many blocks and marbles are there altogether? (Point to blocks and marbles.) (25)

If child gives correct number for only blocks or marbles, repeat question stressing altogether.

NUMERICAL TEST

II. ADDITION

Stop after 3 consecutive failures.

(If child starts to count with his finger, say: DON'T COUNT WITH YOUR FINGER ON THE PICTURE.)

Sample: THERE ARE FIVE CHILDREN ON THIS SIDE OF THE STREET (point). WHEN THESE TWO CHILDREN GET TO THIS SIDE OF THE STREET (point), HOW MANY CHILDREN WILL BE ON THIS SIDE? (point). (7)

If correct, say: YES,)
If incorrect, say: NO,) FIVE HERE AND TWO MORE MAKE SEVEN.

1. There are two trees here. If one more is planted, how many trees will there be altogether? (3)

2. There are 3 girls in the picture. If 2 more girls come, how many girls will there be altogether? (5)

3. There are 4 boys. If 3 more boys come, how many boys will there be altogether? (7)

4. There are 5 cars. If 3 more cars come, how many cars will there be altogether? (8)

5. The girl has 13 blocks. If a friend gives her 4 more, how many blocks will she have altogether? (17)

6. The house on the right has 9 windows in front. If it has 6 windows in back, how many windows does it have, front and back together? (15)

7. There are 7 children. If 5 more come, how many children will there be altogether? (12)

8. The boy has 12 marbles. If someone gives him 9 more marbles, how many will he have altogether? (21)

9. There are 2 trees in the picture. If 2 more trees are planted across the street, and 3 more on this side, how many trees will there be altogether? (7)

10. There are 7 children in the picture. If 4 more boys come to play and 5 more girls come to play, how many children will there be altogether? (16)

NUMERICAL TEST

III. MULTIPLICATION

Stop after 3 consecutive failures.

(If child starts to count with his finger, say: DON'T COUNT WITH YOUR FINGER ON THE PICTURE.)

Show picture of children in front of fruit stand, and say:

NOW WE HAVE ANOTHER PICTURE.

Point to fruit and correct number of children when asking each question.

Sample: THERE ARE TWO BOYS IN THE PICTURE. IF EACH BOY IS GIVEN TWO MELONS, HOW MANY MELONS WILL THE 2 BOYS HAVE ALTOGETHER? (4)

If correct, say: YES,
If incorrect, say: NO,
YOU SEE THE TWO BOYS. IF EACH ONE GETS 2 MELONS (pointing to the 2 sets of melons), THEY WILL HAVE 4 MELONS ALTOGETHER (pointing to all 4 melons).

Be sure they understand the sample.

1. If 2 of the children are given 5 apples each, how many apples will they have altogether? (10)
2. If 3 of the children are given 2 bananas each, how many bananas will they have altogether? (6)
3. If 3 of the children are given 5 oranges each, how many oranges will they have altogether? (15)
4. If 3 of the children are given 3 apples each, how many apples will they have altogether? (9)
5. If 2 of the children are given 4 apples each, how many apples will they have altogether? (8)
6. If the 4 children are given 3 oranges each, how many oranges will they have altogether? (12)
7. If the 4 children are given 4 oranges each, how many oranges will they have altogether? (16)
8. If 2 of the children are given 7 oranges each, how many oranges will they have altogether? (14)
9. If 3 of the children are given 6 oranges each, how many oranges will they have altogether? (18)
10. If the 4 children are given 6 pieces of fruit each, how many pieces of fruit will they have altogether? (24)

NUMERICAL TEST

IV. SUBTRACTION

Stop after 3 consecutive failures.

(If child starts to count with his finger, say:
DON'T COUNT WITH YOUR FINGER ON THE PICTURE.)

Show street scene.

Sample: THERE ARE 3 BOYS PLAYING HERE (pointing lower right). IF 1 BOY LEAVES, HOW MANY BOYS WILL STILL BE PLAYING THERE? (2)

If correct, say: YES,)
If incorrect, say: NO,) THERE ARE THREE BOYS, AND IF ONE GOES AWAY, THERE WILL BE TWO LEFT. (Demonstrate).

1. There are 4 boys in the picture. If 2 went away, how many would be left? (2)
2. There are 5 cars parked here. If 4 cars leave, how many cars will still be parked here? (1)
3. There are 7 children here. If 3 children leave, how many children will still be here? (4)
4. There are 9 windows ;in the house on the right. If 4 windows are covered over, how many windows would be left? (5)
5. There are 7 children here. If 2 children go home and 3 go to the park, how many children will still be here? (2)
6. This little girl has 13 blocks. If she gives 3 of them away, how many blocks will she have left? (10)
7. The boy has 12 marbles. If he gives 4 of them away, how many will he have left? (8)
8. The girl has 13 blocks. If she gives 6 of them away, how many will she have left? (7)
9. The boy has 12 marbles. If he gives one boy 3 marbles and another boy 4 marbles, how many marbles will he have left? (5)
10. The girl has 13 blocks. If she gives one boy 5 blocks and another boy 2 blocks, how many blocks will she have left? (6)

NUMERICAL TEST

V. DIVISION

Stop after 3 consecutive failures.

(If child starts to count with his finger, say: DON'T COUNT WITH YOUR FINGER ON THE PICTURE.)

Show picture of fruit stand.

Sample: NOW I HAVE SOME QUESTIONS ABOUT CHILDREN SHARING FRUIT. THERE ARE 6 PEARS HERE (point) , AND THESE TWO BOYS WILL SHARE THEM (point). IF EACH OF THE 2 BOYS GET THE SAME NUMBER OF PEARS, HOW MANY PEARS WILL EACH ONE GET? (3)

If correct, say: YES,)
) THERE ARE SIX PEARS (pointing).
If incorrect, say: NO,) IF YOU GIVE SIX PEARS TO TWO BOYS SO THAT EACH HAS THE SAME NUMBER, EACH BOY WILL GET 3 PEARS (pointing to sets of three pears).

Point to fruit and correct number of children when asking each question.

1. Here are 4 melons. If each of the ~~3~~ 2 boys gets the same number of melons, how many will each one get? (2)
2. There are 6 pears. If each of 3 children gets the same number of pears, how many will each one get? (2)
3. There are 9 bananas. If each of 3 children gets the same number of bananas, how many will each one get? (3)
4. There are 12 apples. If each of the 3 children gets the same number of apples, how many will each one get? (4)
5. There are 12 apples. If each of the 4 children gets the same number of apples, how many apples will each one get? (3)
6. If 10 oranges are given to 2 children so that each has the same number, how many oranges will each one have? (5)
7. There are 12 apples. If each of 2 children gets the same number of apples, how many applea will each one get? (6)
8. There are 20 oranges. If each of 2 children gets the same number of oranges how many will each one get? (10)
9. There are 20 oranges. If each of the 4 children gets the same number of oranges, how many will each one get? (5)
10. There are 32 apples and oranges altogether. If each of the 4 children gets the same number, how many pieces of fruit will each one get? (8)

SPACE

I. OBJECT COMPLETION

Allow no more than about 20 seconds for each item.

Stop after 5 consecutive failures.

Introduce test by saying,

I HAVE SOME PICTURES WHICH ARE NOT FINISHED.

I WANT YOU TO LOOK AT THEM AND TELL ME WHAT THEY ARE.

Show Sample and ask,

WHAT IS THIS A PICTURE OF?

If correct, say: YES)
) IF THE PICTURE WERE FINISHED IT
If incorrect, say: NO,) WOULD BE A T.V. (Tracing outline)

For all items, ask:

WHAT IS THIS A PICTURE OF?

II. JIG SAW PUZZLES

Allow about 3 minutes for each puzzle.

Stop after 3 consecutive failures.

Introduce test by saying:

NOW I HAVE SOME PUZZLES FOR YOU.

Place model on table and then the pieces, so that the model is beyond the pieces in front of the child. The pieces are laid out according to the letters on the back, and are placed in sequence from the child's left to his right.

Say:

PUT THESE PIECES TOGETHER SO THEY MAKE A SHAPE LIKE THIS . (Pointing to model) TELL ME WHEN WHEN YOU HAVE FINISHED.

Demonstrate correct placement if child cannot do sample. Go on to first item.

When each item is presented, point to model and say:

NOW MAKE THIS.

When child is randomly moving pieces, focus him on model again by saying:

MAKE IT LOOK LIKE THIS.

If child says that there are not enough pieces to complete a puzzle, assure him that there are.

SPACE

III. ESTIMATING PATH

Administer all items.

Introduce test by saying:

NOW HERE ARE SOME PICTURES WITH AIRPLANES.

Show Sample 1 and say,

SEE THIS AIRPLANE (Pointing)? ITS TRAIL (Pointing) SHOWS THE PATH IT IS FOLLOWING. THIS TRAIL SHOWS IT IS GOING IN A STRAIGHT LINE. HERE IT GOES INTO THE CLOUD (Point). IF IT FOLLOWS THE SAME STRAIGHT LINE, WHERE WILL IT COME OUT OF THE CLOUD--HERE, OR HERE, OR HERE, OR HERE. (Indicating points)?

If correct, go on to next 5 items, saying each time:

WHERE WILL THIS ONE COME OUT OF THE CLOUD?

If incorrect, explain correct response, tracing trail with finger, then go on to Item 1.

Child should not be allowed to trace trail of airplane with finger; ask him to look, or use his eyes.

If child points somewhere between the letters, point to the letters and

Ask: AT WHICH ONE OF THESE PLACES WOULD IT COME OUT?

Do not explain items other than the samples.

Show Sample 2 after item 5 has been administered, and say:

THE REST OF THE PICTURES SHOW TWO AIRPLANES (Pointing). THIS ONE (Point) IS GOING IN A STRAIGHT LINE (Follow the path straight across the card). THIS ONE (Point) IS FOLLOWING THE PATH SHOWN BY ITS TRAIL. (Follow contrail with finger.) WHERE WOULD THE 2 PLANES MEET? HERE, OR HERE, OR HERE, OR HERE? (Indicating lettered points.)

If correct or incorrect, indicated by following both trails simultaneously with fingers, where the planes would meet.

Say: YES, / NO, SEE, THEY WOULD MEET HERE.

Present items 6-12, saying each time:

[illegible] AT WHICH ONE OF THESE POINTS (indicating) WOULD THEY MEET?

SPACE

IV. PERSPECTIVE

Administer all items.

Introduce test by saying:

LET'S LOOK AT THESE.

Show sample and say:

HERE IS A PICTURE OF A GIRL AND BOY WALKING TOWARD EACH OTHER.
SEE THE BOY AND THE GIRL? (Pointing)

Show the 4 views of the scene and say:

a. WHICH ONE OF THESE PICTURES SHOWS WHAT THE BOY SEES?
(Pointing to boy.)

If correct, say; THAT'S RIGHT.)
) THEY ARE WALKING TOWARD EACH OTHER,
If incorrect, say: NO.) SO HE WOULD SEE THE FACE OF THE
GIRL AND THE TREE. (Pointing to
correct choice.)

b. WHICH ONE OF THESE PICTURES SHOWS WHAT THE GIRL SEES?
(pointing to girl.)

If correct, say: THAT'S RIGHT. THEY ARE WALKING TOWARD EACH OTHER,
SO SHE WOULD SEE THE FACE OF THE
BOY AND THE TREE. (Pointing to
correct choice.)

If incorrect, go back to main picture and ask:

WHAT DOES THE GIRL SEE IN THE PICTURE?

Make sure the child understands that the girl sees the face of the boy and the tree.

Ask child to choose again.

If incorrect again, point out correct choice and explain it.

I. HERE IS A PICTURE OF A LITTLE BOY WHO IS PLAYING WITH HIS BALL ON THE SIDEWALK. SEE THE BOY? THE MAILMAN IS WALKING DOWN THE OTHER SIDE OF THE STREET. SEE THE MAILMAN? THE BOY'S MOTHER IS LOOKING OUT THE WINDOW. SEE HIS MOTHER?

Show the 5 views of the scene and say:

1. WHICH ONE OF THESE PICTURES SHOWS WHAT THE BOY SEES? (Pointing to boy.) (3)
2. WHICH ONE OF THESE PICTURES SHOWS WHAT THE MAILMAN SEES? (Pointing to mailman.) (1)
3. WHICH ONE OF THESE PICTURES SHOWS WHAT THE BOY'S MOTHER SEES? (Pointing to mother.) (4)

II. HERE IS A PICTURE OF FOUR CHILDREN AT A PLAYGROUND. THERE IS A BOY AT THE TOP OF THE SLIDE, A BOY IN THE SWING, AND TWO GIRLS ON THE SEESAW -- ONE TOUCHING THE GROUND, AND THE OTHER IN THE AIR. (Point to each of the children.)

Show the 6 views of the scene and say:

4. WHICH ONE OF THESE PICTURES SHOWS WHAT THE BOY AT THE TOP OF THE SLIDE SEES? (Pointing to girl.) (5)
5. WHICH ONE OF THESE PICTURES SHOWS WHAT THE GIRL TOUCHING THE GROUND SEES? (Pointing to boy.) (3)
6. WHICH ONE OF THESE PICTURES SHOWS WHAT THE BOY IN THE SWING SEES? (pointing to boy.) (1)
7. WHICH ONE OF THESE PICTURES SHOWS WHAT THE GIRL IN THE AIR SEES? (Pointing to girl.) (6)

III. HERE IS A PICTURE OF A LITTLE GIRL WHO IS WALKING DOWN THE STREET WITH HER MOTHER. SEE THE GIRL? SEE THE MOTHER? THERE IS A MAN ACROSS THE STREET SELLING NEWSPAPERS. SEE THE NEWSPAPER MAN? THERE IS ALSO A TAXI WITH ITS DRIVER. SEE THE TAXI-DRIVER?

Show the 5 views of the scene and say:

8. Which one of these pictures shows what the girl and her mother see? (Pointing to girl and her mother.) (5)

9. Which one of these pictures shows what the newspaperman sees? (Pointing to newspaperman.) (1)

10. Which one of these pictures shows what the taxi-driver sees? (Pointing to taxi-driver.)

EFFORT

Say: HERE (pointing) ARE A LOT OF DIFFERENT SHAPES. PUT A LINE THROUGH ALL THE ROUND CIRCLES, LIKE THIS (E draws a line through first circle on 1st line). EVERY TIME YOU SEE A ROUND CIRCLE, PUT A LINE THROUGH IT LIKE THIS (drawing line through second circle on first line). DO AS MANY AS YOU CAN BEFORE I TELL YOU TO STOP.

The first line is for E to illustrate; the second line is for S to practice. Start keeping time when child starts third line. Mark the place on the test form which indicates S's progress after each minute. Stop at end of three minutes. E turns pages for S. Be certain to indicate S's name on each sheet. Number the sheets.

PERSUASIBILITY

Say: HERE IS A GAME WHICH HAS NO RIGHT OR WRONG ANSWERS. I JUST WANT TO GET YOUR IDEAS ABOUT THESE THINGS. FOR EXAMPLE, HERE ARE TWO OLD-FASHIONED CARS; DRAW A CIRCLE WITH THIS RED CRAYON AROUND THE CAR WHICH YOU LIKE BETTER.

E turns pages for S, asking (when necessary):

> CIRCLE THE OBJECT IN EACH PAIR THAT YOU LIKE BETTER.

After the 19 items are completed by S, E says:

> NOW I'M GOING TO GIVE YOU MY IDEAS. I'M GOING TO CIRCLE THE ONE I LIKE WITH THIS BLUE CRAYON.

E tries to make certain that S is watching as E circles his choices. Then E says:

> NOW WE ARE GOING TO LOOK AT THEM ONCE MORE, AND YOU MARK WITH A RED X THE ONE WHICH YOU LIKE BETTER NOW.

Indicate S's name on face sheet of test booklet.

	Agree		Disagree	
Items:	1	Items:	2	12
	4		3	13
	6		5	15
	9		7	16
	10		8	18
	14		11	19
	17			

INTEREST

Say: WE PLAYED A LOT OF GAMES TOGETHER. IF I HAVE TIME TO COME AND SEE YOU AGAIN, WOULD YOU LIKE ME TO BRING

NONE OF THE GAMES,

A FEW GAMES

OR

A LOT OF GAMES?

E gets answer and then says he probably will not have time to come again, but will remember S's answer if E does come again.

APPENDIX B

SCORING FORMS FOR TESTS OF MENTAL ABILITY

NAME________________________________ CODE________

Last First Middle

School________________________________ Sex________

	Year	Month	Day
Testing Date:	____	____	____
Birth Date:	____	____	____
Age:	____ Years	____ Mos.	

PICTURE VOCABULARY

Administer all items.

Record Response given.

1. (mailman)________________
2. (clouds)________________
3. (ladder)________________
4. (candle)________________
5. (helicopter)________________
6. (bench)________________
7. (motorcycle)________________
8. (leaves)________________
9. (needles)________________
10. (garbage truck)________________
11. (hydrant)________________
12. (saddle)________________
13. (barrel)________________
14. (traffic light)________________
15. (TV-movie camera)________________
16. (baseball mitt-glove)________________
17. (crane)________________
18. (awning)________________
19. (writing)________________
20. (painting)________________
21. (sweeping)________________
22. (typing)________________
23. (boxing)________________
24. (sawing)________________
25. (ice skating)________________
26. (erasing)________________
27. (wrapping)________________
28. (diving)________________
29. (decorating)________________
30. (juggling)________________

VERBAL VOCABULARY -- Session I

Name__________________________ Birthdate________ TEST DATE_____

Last First Middle

Record response given.

Stop after 4 consecutive complete failures.

S. APPLE______________________________

1. STOVE______________________________

2. BIRD______________________________

3. TELEPHONE______________________________

4. NEWSPAPER______________________________

5. CAREFUL______________________________

6. HELP______________________________

7. WEST______________________________

8. ADDRESS______________________________

9. ALWAYS______________________________

10. REPAIR______________________________

11. COOPERATE______________________________

12. EXPLAIN______________________________

13. WORRY______________________________

14. INVESTIGATE______________________________

15. SUFFER______________________________

VERBAL VOCABULARY -- Session II

Name________________________ Birthdate________ Test Date______
Last First Middle

Record response given.

Stop after 4 consecutive **complete** failures.

1. DOLLAR____________________
2. BOOK____________________
3. FLOWER____________________
4. LOOK____________________
5. SHARP____________________
6. CELEBRATE____________________
7. NEARBY____________________
8. PUNISH____________________
9. FORGET____________________
10. WELCOME____________________
11. PROTECT____________________
12. DICTIONARY____________________
13. FAMOUS____________________
14. SUDDENLY____________________
15. BIRTH____________________

REASONING

Name_______________________________ Birthdate________ Test Date________
Last First Middle

PICTURE ANALOGIES

Record letter given
Stop after 3 consec. failures

S-1(C)_____
S-2(B)_____
1.(B)_____
2.(B)_____
3.(A)_____
4.(B)_____
5.(D)_____
6.(C)_____
7.(A)_____
8.(A)_____
9.(D)_____
10.(C)_____
11.(C)_____
12.(D)_____
13.(C)_____
14.(C)_____
15.(D)_____
16.(B)_____
17.(A)_____
18.(C)_____

PICTURE ARRANGMENT

Record letter order
Stop after 3 consec. failures

S. COW_______
1. CAT_______
2. GROW WORG_______
3. WAIT_______
4. RIDE RIED_______
5. TRAP PART_______
6. DRAW WARD_______
7. BOX_______
8. PIG_______
9. RAIL LIAR_______
10. BOY_______
11. RUNS_______
12. SODA_______
13. HOLD_______
14. BOWL_______
15. LINE_______
16. PET_______

JUMP PEG

Enter # pegs remaining, plus 1 point if last peg is in center.
Stop after 3 consec. items on which more than 1 peg remains.
On **samples** score only p=right; f =wrong.

S-1. 1._____
2._____
3._____

S-2 1._____
2._____
3._____

	# left	Bonus: 1 if last peg in center	Total
1.	3 - ( ) +	( ) =	_____
2.	4 - ( ) +	( ) =	_____
3.	5 - ( ) +	( ) =	_____
4.	4 - ( ) +	( ) =	_____
5.	5 - ( ) +	( ) =	_____
6.	6 - ( ) +	( ) =	_____
7.	6 - ( ) +	( ) =	_____
8.	6 - ( ) +	( ) =	_____
9.	7 - ( ) +	( ) =	_____
10.	7 - ( ) +	( ) =	_____
11.	8 - ( ) +	( ) =	_____
12.	9 - ( ) +	( ) =	_____

B-5

NUMERICAL

NAME ______________________ BIRTHDATE __________ TEST DATE ______

I. ENUMERATION

Give sll items.
Record response given.

S-(2) ______
1.(3) ______
2.(5) ______
3.(9) ______
4.(7) ______
5.(13) ______
6.(25) ______

II. ADDITION

Stop after 3 consec. failures.
Record response given.

S-(7) ______
1.(3) ______
2.(5) ______
3.(7) ______
4.(8) ______
5.(17) ______
6.(15) ______
7.(12) ______
8.(21) ______
9.(7) ______
10.(16) ______

III. MULTIPLICATION

Stop after 3 consec. failures.
Record response given.

S-(4) ______
1.(10) ______
2.(6) ______
3.(15) ______
4.(9) ______
5.(8) ______
6.(12) ______
7.(16) ______
8.(14) ______
9.(18) ______
10.(24) ______

IV. SUBTRATION

Stop after 3 consec. failures.
Record response given.

S-(2) ______
1.(2) ______
2.(1) ______
3.(4) ______
4.(5) ______
5.(2) ______
6.(10) ______
7.(8) ______
8.(7) ______
9.(5) ______
10.(6) ______

V. DIVISION

Stop after 3 consec. failures.
Record response given.

S-(3) ______
1.(2) ______
2.(2) ______
3.(3) ______
4.(4) ______
5.(8) ______
6.(6) ______
7.(5) ______
8.(10) ______
9.(5) ______
10.(8) ______

SPACE

Name________________________________ Birthdate_______ Test Date_________
Last First Middle

Object Completion

Record response given. Stop after 5 consecutive failures.

S.(TV)_______________
1.(car)_______________
2.(fork)_______________
3.(clock)_______________
4.(spoon)_______________
5.(dog)_______________
6.(glasses)_______________
7.(bird)_______________
pot
8.(pan)_______________
9.(chair)_______________
10.(ice cream cone)...._______________
11.(plane)_______________
12.(scissors)_______________
13.(hanger)_______________
14.(wheelbarrow)_______________
15.(flower pot)_______________
16.(iron)_______________

Estimating Path

Record letter chosen. Give all items.

S-1(X)____
1.(Y)____
2.(Y)____
3.(X)____
4.(W)____
5.(X)____
S-2(Y)____
6.(X)____
7.(W)____
8.(Y)____
9.(Z)____
10.(Y)____
11.(Y)____
12.(Y)____

Jigsaw Puzzle

Record p=right f=wrong Stop after 3 consecutive f's

S-1. ______
1. ______
2. ______ I.
3. ______
4. ______
5. ______ II.
6. ______
7. ______
8. ______
9. ______ III.
10. ______
11. ______
12. ______
13. ______
14. ______
15. ______
16. ______

Perspective

Record number of picture chosen. Give all items

S-1. (2)______
S-2. (3)______
1.(3)______
2.(1)______
3.(4)______
4.(5)______
5.(3)______
6.(1)______
7.(6)______
8.(5)______
9.(1)______
10.(4)______

Appendix C

Analysis of Variance Tables for Individual Mental Ability Subtests

Table C1

Analysis of Variance of Picture Vocabulary Scores (Verbal)

Source	SS	dF	MS	F	p
Class	3,451.878	1	3,451.878	85.79	<.001
Ethnicity	7,789.159	3	2,596.386	64.52	<.001
Sex	398.278	1	398.278	9.90	<.01
Class & Ethnicity	241.585	3	80.528	2.00	—
Class & Sex	8.128	1	8.128		—
Sex & Ethnicity	563.935	3	187.978	4.67	<.01
Class & Sex & Ethnicity	75.484	3	25.161		—
Individual	12,232.550	304	40.238		
Total	24,760.997	319	77.620		

Table C2

Analysis of Variance of Work Vocabulary Scores (Verbal)

Source	SS	dF	MS	F	p
Class	6,507.028	1	6,507.028	100.21	<.001
Ethnicity	10,808.409	3	3,602.803	55.48	<.001
Sex	.528	1	.528		—
Class & Ethnicity	636.160	3	212.053	3.26	<.05
Class & Sex	209.628	1	209.628	3.23	—
Sex & Ethnicity	730.160	3	243.386	3.75	<.05
Class & Sex & Ethnicity	139.509	3	46.503		—
Individual	19,739.550	304	64.932		
Total	38,770.972	319	121.245		

Table C3

Analysis of Variance of
Picture Analogies Scores
(Reasoning)

Source	SS	dF	MS	F	p
Class	340.312	1	340.312	36.14	<.001
Ethnicity	318.825	3	106.275	11.29	<.001
Sex	.050	1	.050		—
Class & Ethnicity	68.013	3	22.671	2.41	—
Class & Sex	1.513	1	1.513		—
Sex & Ethnicity	43.825	3	14.608	1.55	—
Class & Sex & Ethnicity	62.812	3	20.937	2.22	—
Individual	2,862.200	304	9.415		
Total	3,697.550	319	11.591		

Table C4

Analysis of Variance of
Picture Arrangement Scores
(Reasoning)

Source	SS	dF	MS	F	p
Class	969.528	1	969.528	18.91	<.001
Ethnicity	430.234	3	160.078	10.49	<.001
Sex	3.828	1	3.828		—
Class & Ethnicity	268.359	3	89.453	5.86	<.001
Class & Sex	1.953	1	1.953		—
Sex & Ethnicity	61.460	3	20.486	1.34	—
Class & Sex & Ethnicity	37.985	3	12.661		—
Individual	4,638.650	304	15.258		
Total	6,461.997	319	20.257		

Table C5

Analysis of Variance of
Jump Peg Scores
(Reasoning)

Source	SS	dF	MS	F	p
Class	154.012	1	154.012	16.11	<.001
Ethnicity	291.638	3	92.212	9.65	<.001
Sex	70.312	1	70.312	7.36	<.01
Class & Ethnicity	31.338	3	10.446	1.09	—
Class & Sex	.614	1	.614		—
Sex & Ethnicity	44.738	3	14.912	1.56	—
Class & Sex & Ethnicity	6.936	3	2.312		—
Individual	2,905.900	304	9.558		
Total	3,505.488	319	10.988		

Table C6

Analysis of Variance of
Enumeration Scores
(Numerical)

Source	SS	dF	MS	F	p
Class	29.403	1	29.403	24.120	<.001
Ethnicity	38.359	3	12.786	10.489	<.001
Sex	3.003	1	3.003	2.463	—
Class & Ethnicity	11.510	3	3.837	3.148	<.05
Class & Sex	3.003	1	3.003	2.463	—
Sex & Ethnicity	1.210	3	.403		—
Class & Sex & Ethnicity	3.709	3	1.236	1.095	—
Individual	370.550	304	1.219		
Total	460.747	319	1.444		

Table C7

Analysis of Variance of
Addition Scores
(Numerical)

Source	SS	dF	MS	F	p
Class	340.312	1	340.312	55.174	<.001
Ethnicity	510.212	3	170.071	27.573	<.001
Sex	.200	1	.200		—
Class & Ethnicity	98.614	3	32.871	5.329	<.01
Class & Sex	1.800	1	1.800		—
Sex & Ethnicity	3.276	3	1.092		—
Class & Sex & Ethnicity	6.974	3	2.325		—
Individual	1,875.000	304	6.168		
Total	2,836.388	319	8.891		

Table C8

Analysis of Variance of Subtraction Scores (Numerical)

Source	SS	dF	MS	F	p
Class	290.703	1	290.703	38.601	<.001
Ethnicity	345.784	3	115.261	15.305	<.001
Sex	19.503	1	19.503	2.590	—
Class & Ethnicity	70.060	3	23.353	3.101	<.05
Class & Sex	3.828	1	3.828		—
Sex & Ethnicity	6.460	3	2.153		—
Class & Sex & Ethnicity	30.784	3	10.261	1.362	—
Individual	2,289.350	304	7.531		
Total	3,056.472	319	9.581		

Table C9

Analysis of Variance of
Multiplication Scores
(Numerical)

Source	SS	dF	MS	F	p
Class	330.078	1	330.078	37.071	<.001
Ethnicity	608.359	3	202.786	24.748	<.001
Sex	.078	1	.078		--
Class & Ethnicity	49.460	3	16.487	2.012	--
Class & Sex	1.378	1	1.378		--
Sex & Ethnicity	32.910	3	10.970	1.339	--
Class & Sex & Ethnicity	12.709	3	4.236		--
Individual	2,490.950	304	8.194		
Total	3,525.922	319	11.053		

Table C10

Analysis of Variance of
Division Scores
(Numerical)

Source	SS	dF	MS	F	p
Class	271.953	1	271.953	38.823	<.001
Ethnicity	200.259	3	66.753	9.529	<.001
Sex	.703	1	.703		—
Class & Ethnicity	33.260	3	11.087	1.583	—
Class & Sex	4.278	1	4.278		—
Sex & Ethnicity	8.710	3	2.903		—
Class & Sex & Ethnicity	18.684	3	6.228		—
Individual	2,129.650	304	7.005		
Total	2,667.497	319	8.362		

Table C11

Analysis of Variance of
Object Completion Scores
(Space)

Source	SS	dF	MS	F	p
Class	1,328.450	1	1,328.450	34.754	<.001
Ethnicity	441.312	3	147.104	3.848	<.05
Sex	9.112	1	9.112		—
Class & Ethnicity	596.426	3	198.808	5.201	<.01
Class & Sex	7.200	1	7.200		—
Sex & Ethnicity	605.014	3	201.671	6.276	<.01
Class & Sex & Ethnicity	93.674	3	31.225		—
Individual	11,620.200	304	38.224		
Total	14,701.388	319	46.086		

Table C12

Analysis of Variance of
Estimating Path Scores
(Space)

Source	SS	dF	MS	F	p
Class	37.812	1	37.812	11.341	<.01
Ethnicity	63.475	3	21.158	6.346	<.001
Sex	7.812	1	7.812	2.343	—
Class & Ethnicity	20.613	3	6.871	2.061	—
Class & Sex	9.801	1	9.801	2.940	—
Sex & Ethnicity	15.063	3	5.021	1.506	—
Class & Sex & Ethnicity	4.674	3	1.558		—
Individual	1,013.500	304	3.334		
Total	1,172.750	319	3.676		

Table C13

Analysis of Variance of
Jig Saw Scores
(Space)

Source	SS	dF	MS	F	p
Class	363.378	1	363.378	37.990	<.001
Ethnicity	607.584	3	202.528	21.174	<.001
Sex	55.278	1	55.278	5.779	<.05
Class & Ethnicity	98.960	3	32.987	3.449	<.05
Class & Sex	3.828	1	3.828		—
Sex & Ethnicity	41.710	3	13.903	1.454	—
Class & Sex & Ethnicity	97.359	3	32.453	3.393	<.05
Individual	2,907.750	304	9.565		
Total	4,175.847	319	13.090		

Table C14

Analysis of Variance of
Perspective Scores
(Space)

Source	SS	dF	MS	F	p
Class	174.050	1	174.050	31.355	<.001
Ethnicity	122.850	3	74.283	13.382	<.001
Sex	35.112	1	35.112	6.325	<.05
Class & Ethnicity	28.450	3	9.483	1.708	—
Class & Sex	.613	1	.613		—
Sex & Ethnicity	5.438	3	1.813		—
Class & Sex & Ethnicity	7.037	3	2.346		—
Individual	1,132.400	304	5.551		
Total	1,605.950	319	5.034		

Appendix D

Analysis of Variance Tables for Measures of Effort and Persuasibility

Table D1

Analysis of Variance of Effort Scores

Source	SS	dF	MS	*F*	*P*
Class	112.812	1	112.812		--
Ethnicity	14,575.912	3	4,858.637	5.91	<.001
Sex	26.450	1	26.450		--
Class & Ethnicity	1,608.864	3	536.288		--
Class & Sex	273.800	1	273.800		--
Sex & Ethnicity	2,379.376	3	793.125		--
Class & Sex & Ethnicity	634.974	3	211.658		--
Individual	250,002.000	304	822.375		
Total	269,614.188	319	845.186		

Table D2

Analysis of Variance of

Persuasibility Scores

Source	SS	dF	MS	F	P
Class	51.200	1	51.20		—
Ethnicity	978.450	3	326.15	6.36	<.001
Sex	80.000	1	80.00	1.56	—
Class & Ethnicity	291.450	3	97.15	1.89	—
Class & Sex	0	1	0		—
Sex & Ethnicity	234.450	3	78.15	1.52	—
Class & Sex & Ethnicity	124.250	3	41.42		—
Individual	15,586.200	304	51.27		
Total	17,346.000	319	54.38		

Appendix E

Pattern Differences for All Boys *vs*. All Girls, and for Boys and Girls by Social Class and Ethnic Group

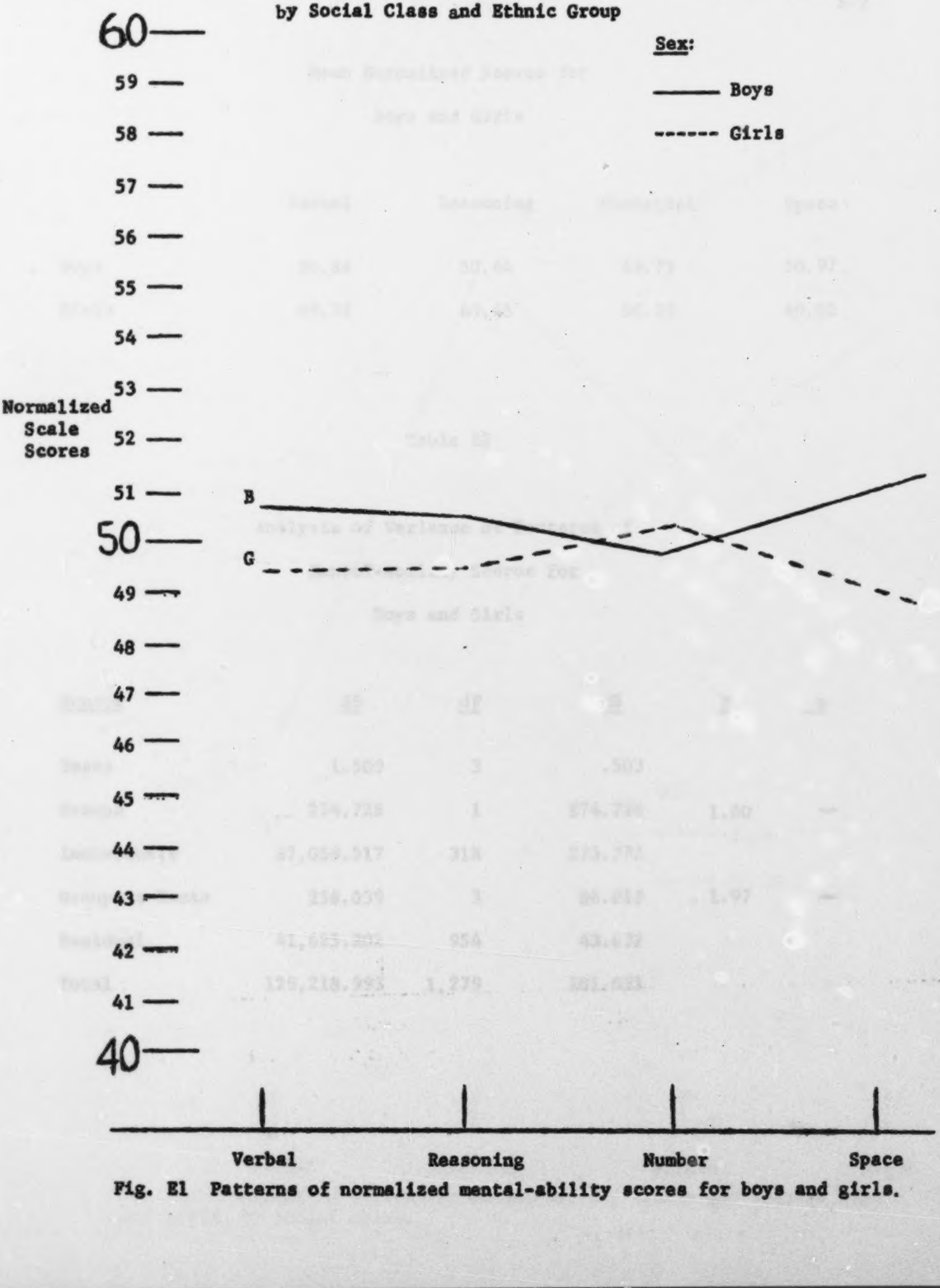

Fig. E1 Patterns of normalized mental-ability scores for boys and girls.

Table E1

Mean Normalized Scores for
Boys and Girls

	Verbal	Reasoning	Numerical	Space
Boys	50.66	50.44	49.71	50.97
Girls	49.38	49.45	50.29	49.02

Table E2

Analysis of Variance of Patterns of
Mental-Ability Scores for
Boys and Girls

Source	SS	dF	MS	F	p
Tests	1.509	3	.503		
Groups	274.726	1	274.726	1.00	—
Individuals	87,059.517	318	273.772		
Groups x Tests	258.039	3	86.013	1.97	—
Residual	41,625.202	954	43.632		
Total	129,218.993	1,279	101.031		

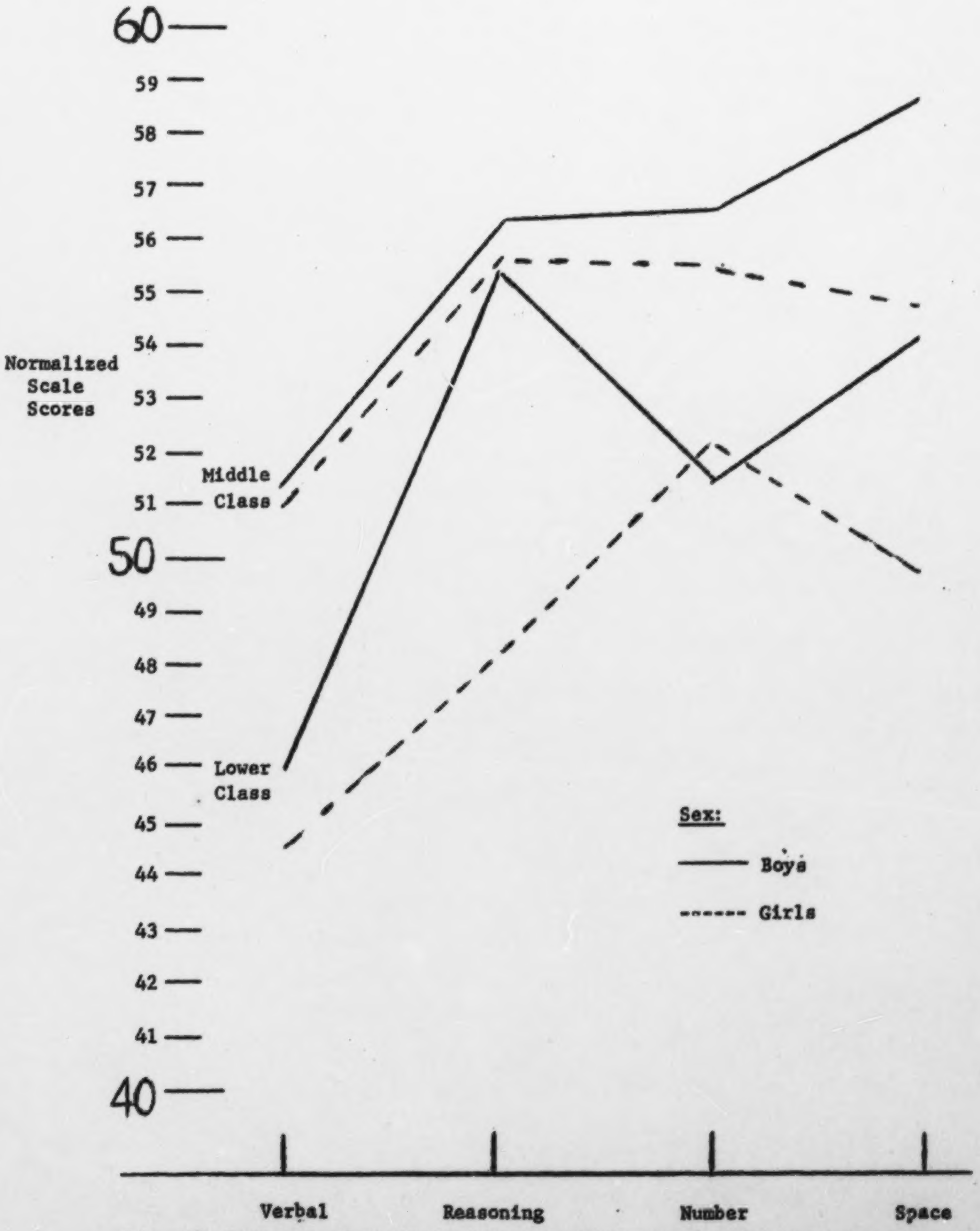

Fig. E2 Patterns of normalized mental-ability scores for Chinese boys and girls, by social class.

Table E3

Mean Normalized Scores for Chinese Boys and Girls, By Social Class

		Verbal	Reasoning	Number	Space
Boys	Middle	51.40	56.30	56.50	58.75
	Lower	45.85	55.40	51.50	54.25
Girls	Middle	51.00	55.60	55.50	54.75
	Lower	44.50	48.20	52.15	49.70

Table E4

Analysis of Variance of Patterns of Mental-Ability Scores for Chinese Boys and Girls, by Social Class

Source	SS	dF	MS	F	p
Tests	2,076.575	3	692.192	18.55	<.001
Groups	2,307.700	3	769.233	4.66	<.01
Individuals	12,544.350	76	165.057		
Groups x Tests	786.975	9	87.442	2.34	<.05
Residual	8,509.950	228	37.324		
Total	25,925.550	319	81.271		

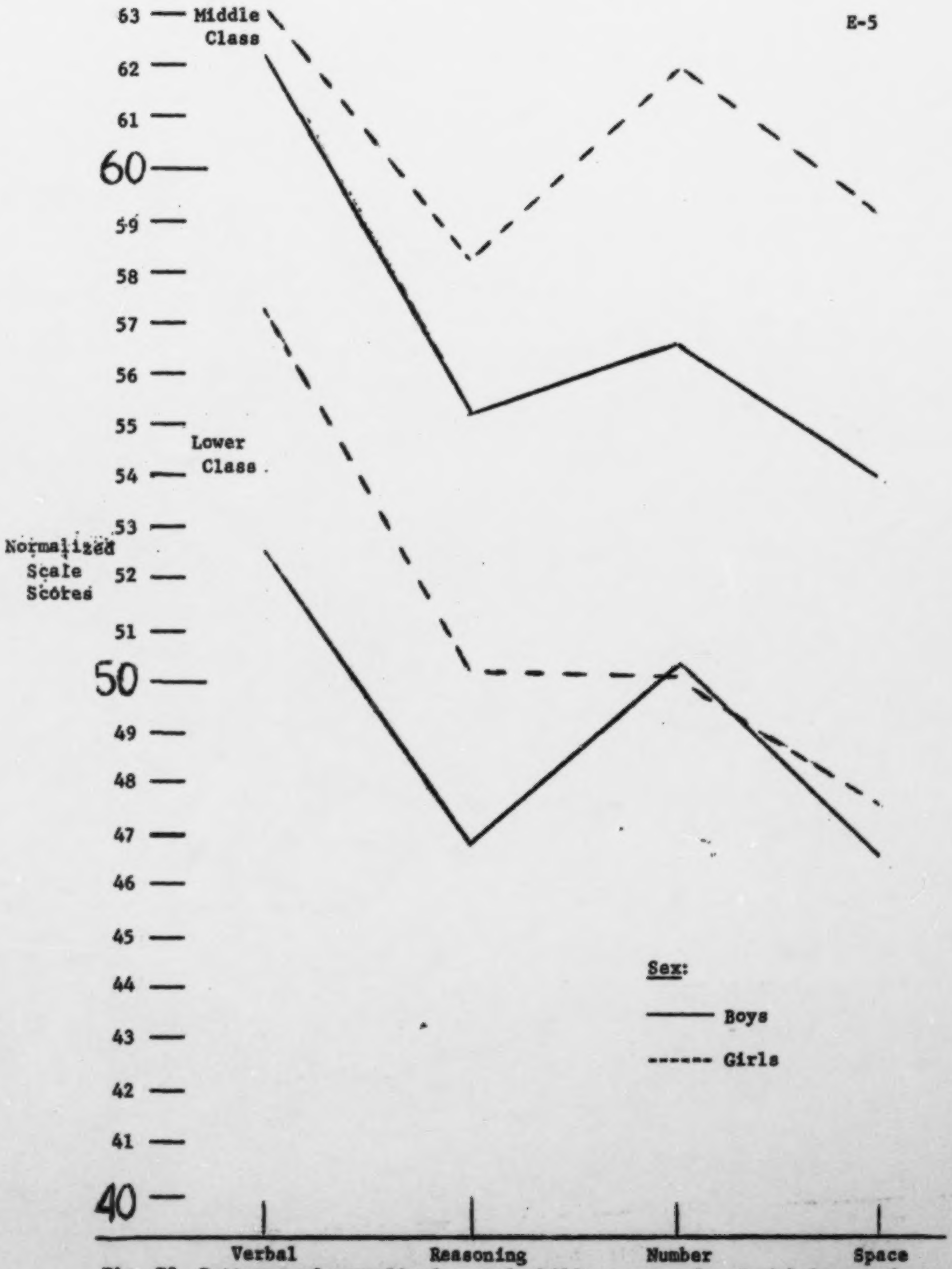

Fig. E3 Patterns of normalized mental-ability scores for Jewish boys and girls, by social class.

Table E5

Mean Normalized Scores for Jewish Boys and Girls, by Social Class

		Verbal	Reasoning	Number	Space
Boys	Middle	62.20	55.20	56.55	53.95
	Lower	52.40	46.80	50.30	46.55
Girls	Middle	63.05	58.25	61.95	59.10
	Lower	57.05	50.20	50.05	47.50

Table E6

Analysis of Variance of Patterns of Mental-Ability Scores for Jewish Boys and Girls, by Social Class

Source	SS	dF	MS	F	p
Tests	2,276.112	3	758.704	20.86	$<$.001
Groups	6,733.862	3	2,244.621	23.20	$<$.001
Individuals	7,353.125	76	96.752		
Groups x Tests	318.014	9	35.335	0.97	—
Residual	8,291.875	228	36.368		
Total	24,972.988	319	78.285		

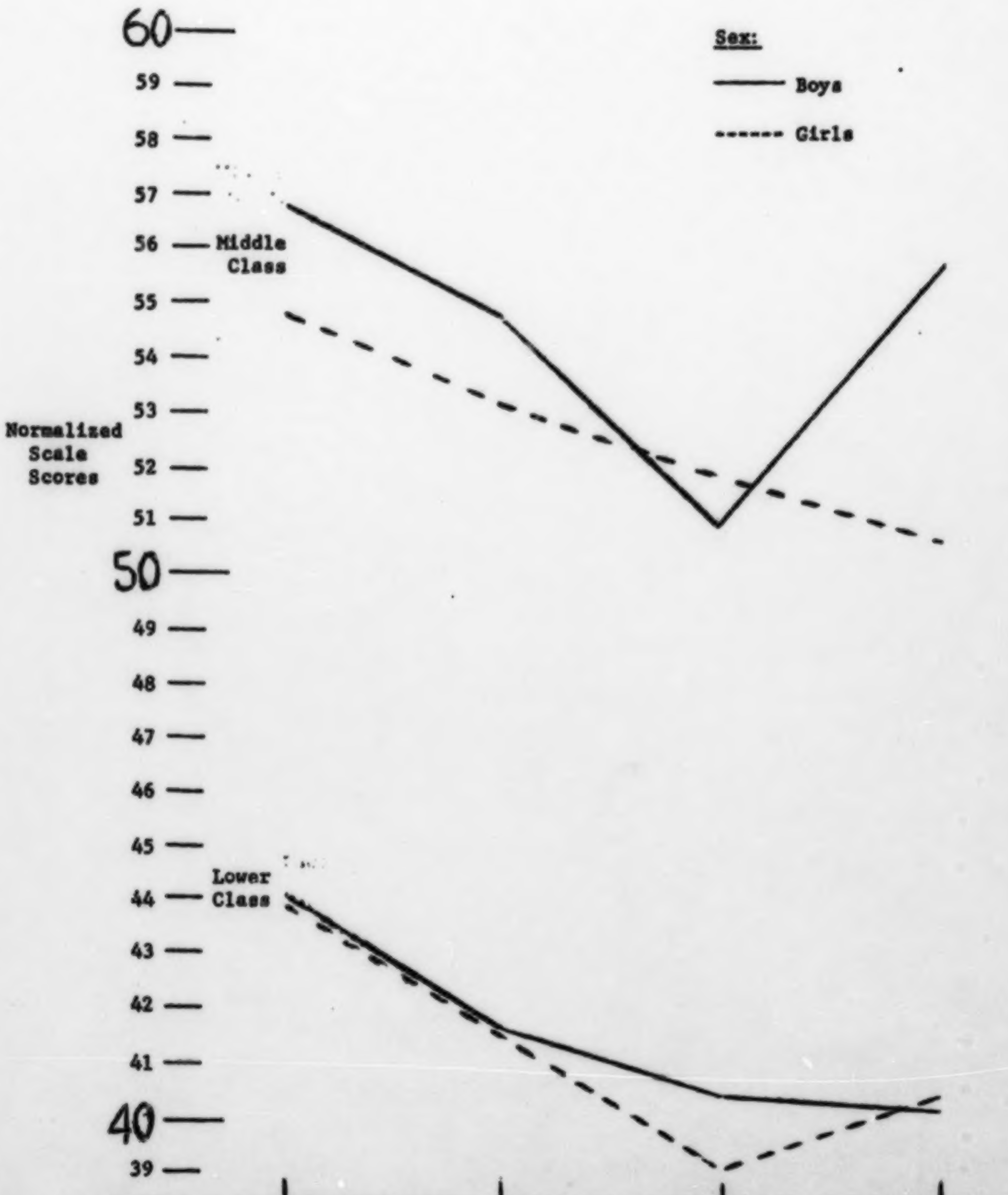

Fig. E4 Patterns of normalized mental-ability scores for Negro boys and girls, by social class

Table E7

Mean Normalized Scores for
Negro Boys and Girls,
by Social Class

		Verbal	Reasoning	Number	Space
Boys	Middle	56.80	54.75	50.80	55.30
	Lower	44.10	41.55	40.25	39.90
Girls	Middle	54.75	53.05	51.70	50.45
	Lower	43.90	41.40	38.95	40.25

Table E8

Analysis of Variance of Patterns
of Mental-Ability Scores for
Negro Boys and Girls,
By Social Class

Source	SS	dF	MS	F	p
Tests	881.812	3	293.937	7.36	<.001
Groups	11,986.562	3	3,995.520	28.80	<.001
Individuals	10,542.425	76	138.716		
Groups x Tests	198.314	9	22.035	0.55	—
Residual	9,105.375	228	39.936		
Total	32,714.488	319	102.553		

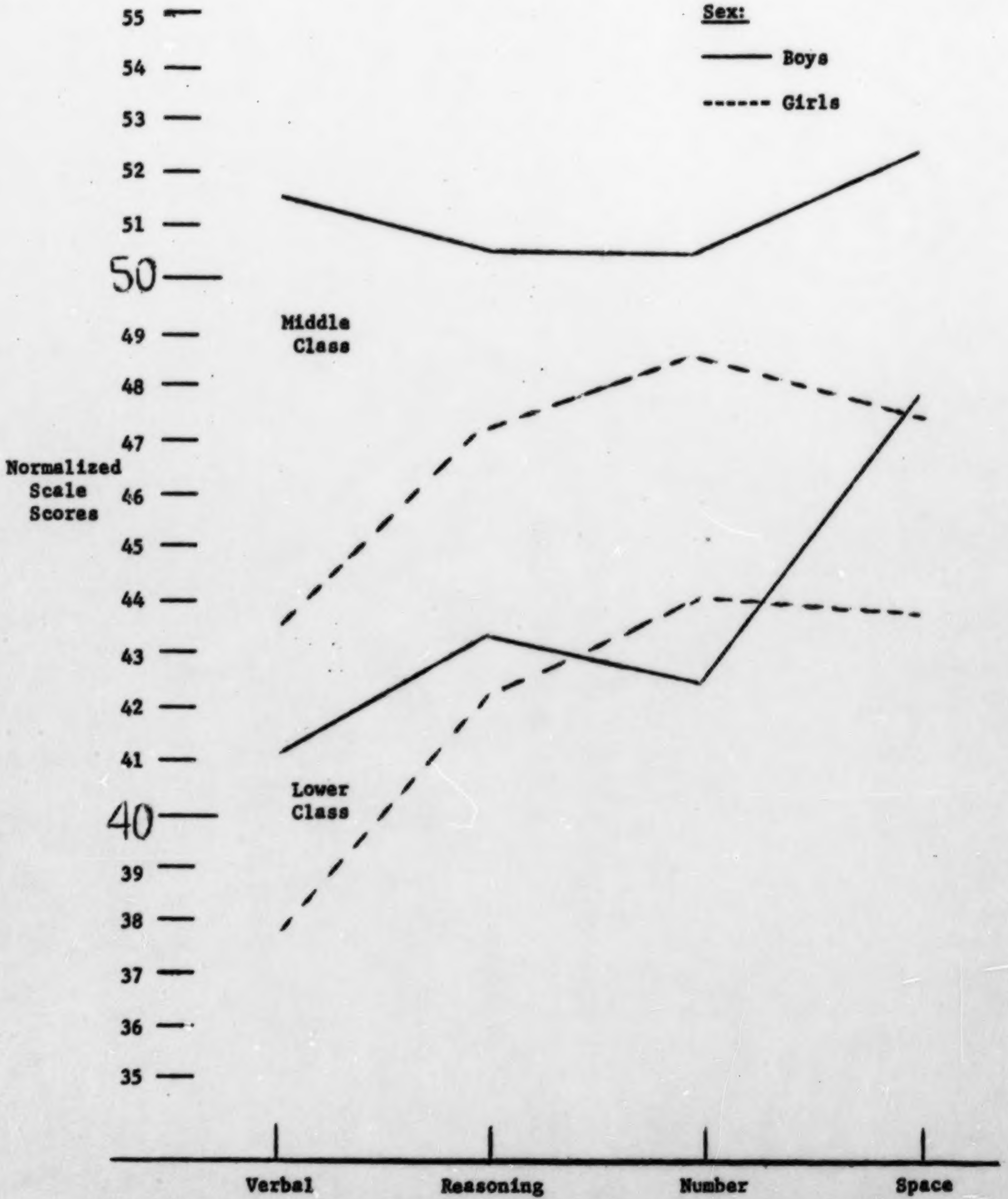

Fig. E5 Pattern of normalized mental-ability scores for Puerto Rican boys and girls, by social class.

Table E9

Mean Normalized Scores for Puerto Rican Boys and Girls, by Social Class

		Verbal	Reasoning	Number	Space
Boys	Middle	51.50	50.40	50.15	51.80
	Lower	41.00	43.10	42.15	47.25
Girls	Middle	43.20	46.95	48.25	47.10
	Lower	37.60	41.95	43.75	43.30

Table E10

Analysis of Variance of Patterns of Mental-Ability Scores for Puerto Rican Boys and Girls, by Social Class

Source	SS	dF	MS	F	p
Tests	680.584	3	226.861	6.09	<.001
Groups	3,992.784	3	1,330.928	6.75	<.001
Individuals	14,974.838	76	197.037		
Groups x Tests	564.954	9	62.773	1.68	—
Residual	8,494.212	228	37.255		
Total	28,707.372	319	89.992		